INSTALLATION RESTORATION PROGRAM
PHASE 1 - RECORDS SEARCH
O'HARE AIR RESERVE FORCES FACILITY, ILLINOIS

Prepared For

UNITED STATES AIR FORCE
HEADQUARTERS
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EXECUTIVE SUMMARY

The Department of Defense (DOD) has developed a program to identify and evaluate past hazardous material disposal sites on DOD property, to control the migration of hazardous contaminants, and to control hazards to health or welfare that may result from these past disposal operations. This program is called the Installation Restoration Program (IRP). The IRP has four phases consisting of Phase I, Initial Assessment/Records Search; Phase II, Confirmation and Quantification; Phase III, Technology Base Development; and Phase IV, Operations/Remedial Actions. Engineering-Science (ES) was retained by the United States Air Forces to conduct the Phase I, Initial Assessment/Records Search for O'Hare Air Reserve Forces Facility (ARFF) under Contract No. F08637-80-R0009.

INSTALLATION DESCRIPTION

The O'Hare Air Reserve Forces Facility complex at O'Hare International Airport is located in the Chicago metropolitan area in northeastern Illinois. The airport is located northwest of downtown Chicago at the boundary of Cook County and DuPage County. All of the property around the airport and Air Force installation is urbanized and used for residential, commercial and/or industrial purposes. The military portion of O'Hare Airport is composed of approximately 400 acres of land in the northwest corner of the airport.

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Initially called Orchard Place Airport, the site was activated in October of 1942, when the government acquired a number of tracts of farm land. The War Assets Corporation erected buildings on this land and leased it in June, 1943, to Douglas Aircraft Company as an assembly plant for the C-54 cargo aircraft. The plant was closed in the fall of 1945.

In 1946, the site was reactivated as a military installation when the 803rd Army Air Force Reserve Specialized Depot assumed control of

the site. In 1949, the military portion was redesignated USAF O'Hare Field, Chicago International Airport. In 1970 the Lockheed C-130A "Hercules" arrived. The 928th Tactical Airlift Group is still the installation's host unit.

ENVIRONMENTAL SETTING

The environmental setting data reviewed for this investigation identified the following major points that are relevant to O'Hare ARFF.

- o Net precipitation at the installation is 4.2 inches which indicates that there is some potential for leachate generation at hazardous waste sites and movement of contaminants in ground water. Rainfall intensity at the installation indicates that there is only a slight potential for erosion and transport of surface contamination from hazardous waste sites. The one-year, 24 hour rainfall event used to gauge erosion and runoff potential was 2.4 inches.
- o The permeability of the surficial unconsolidated deposits at the installation is on the order of 10^{-7} cm/sec which does not allow for rapid infiltration of water.
- o Four aquifer systems exist at the installation. These aquifer systems are in descending order, the glacial drift aquifer, the shallow dolomite aquifer, the Cambrian-Ordovician aquifer system and the Mt. Simon aquifer.
- o The upper glacial drift and shallow dolomite aquifers at the installation are hydraulically connected and are separated from the underlying Cambrian-Ordovician and Mt. Simon aquifers by the relatively impermeable Makoqueta Shale.
- o Numerous wells are located in the vicinity of the installation. Industrial and municipal wells near the installation generally withdraw water from the Cambrian-Ordovician aquifer system. One residential well and one test well identified from the available data withdraw water from the shallow dolomite aquifer. This water is high in dissolved solids and iron.
- o Contamination of ground water may potentially occur at subsurface waste disposal sites on the installation. The glacial

deposits are at least periodically saturated at depths as shallow as 5 feet below land surface.

- o Surface runoff from the installation generally does not meet IEPA stream water quality standards, but is comparable to the water quality upstream in Willow Creek. This poor water quality is typical of highly urbanized areas.
- o Portions of the north end of the installation are within the 100-year flood plan.
- o No threatened or endangered plant or animal species inhabit the installation property.

METHODOLOGY

During the course of this project, interviews were conducted with installation personnel (past and present) familiar with past waste disposal practices; file searches were performed for past hazardous waste activities; interviews were held with local, state and federal agencies; and field and aerial surveys were conducted at suspected past hazardous waste activity sites. Eleven sites located within O'Hare ARFF boundaries were identified as potentially containing hazardous contaminants and having the potential for migration resulting from past activities (Figure 1). These sites have been assessed using a Hazard Assessment Rating Methodology (HARM) which takes into account factors such as site characteristics, waste characteristics, potential for contaminant migration and waste management practices. The details of the rating procedure are presented in Appendix G and the results of the assessment are given in Table 1. The rating system is designed to indicate the relative need for follow-on investigation.

FINDINGS AND CONCLUSIONS

The following conclusions have been developed installationd on the results of the project team's field inspection, review of installation records and files, and interviews with installation personnel.

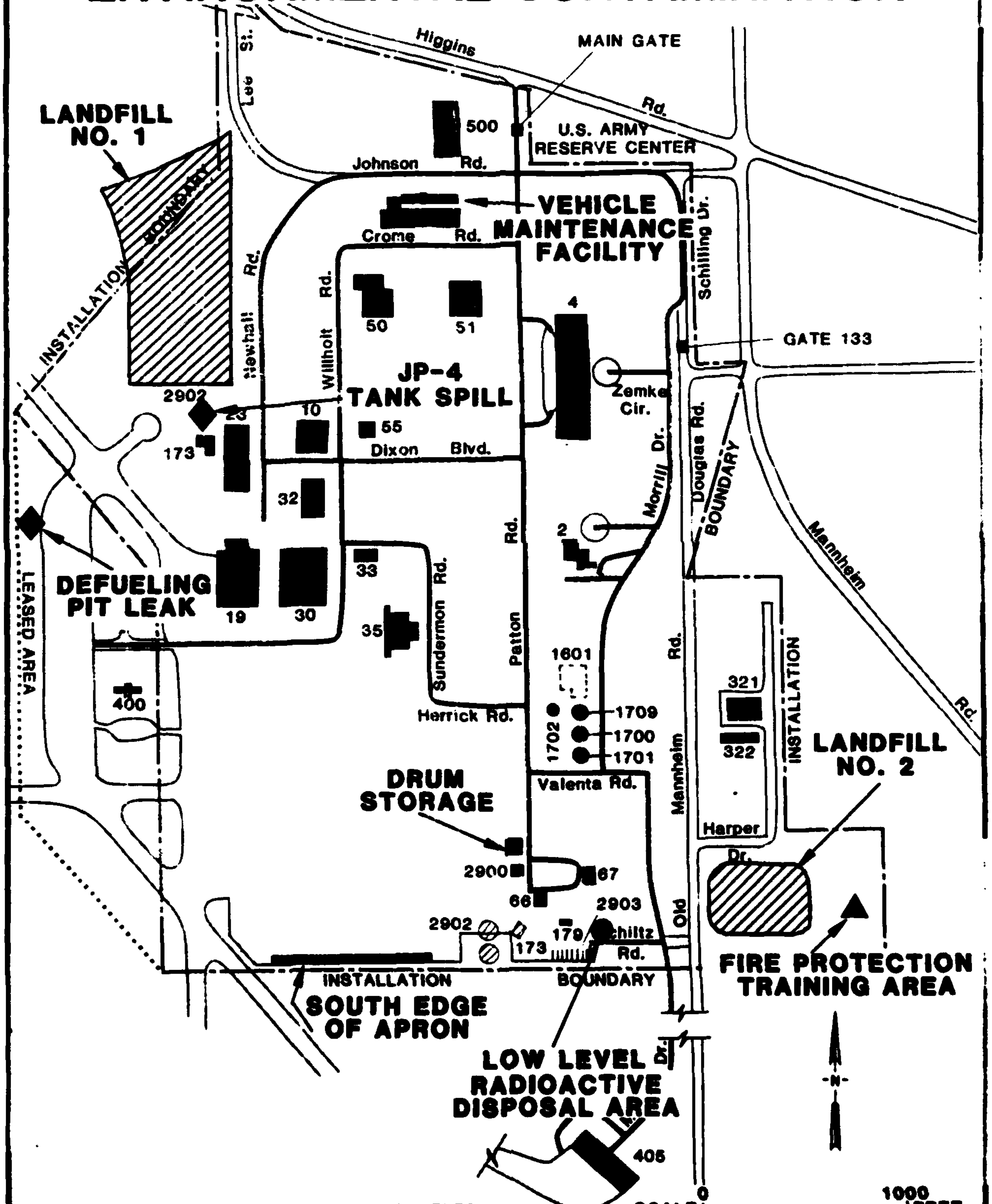
jump!

Nine areas were determined to have a sufficient potential for environmental contamination to warrant further investigaton. They are as follows: → p. 5

FIGURE 1

O'HARE ARFF

SITES OF POTENTIAL ENVIRONMENTAL CONTAMINATION



SOURCE: O'HARE ARFF INSTALLATION DOCUMENTS

TABLE 1

PRIORITY RANKING OF POTENTIAL CONTAMINATION SOURCES

Rank	Site Name	Dates of Operation Or Occurrence	Overall HARM Score
1	Landfill No. 1	1953-1960's	68
2	JP-4 Tank, West POL Area	January 1972	65
3	Fuel-Contaminated Soil	1977	64
4	Defueling Pit Leak Site	Late 1960's	63
5	Fire Protection Training Facility	1955-early 1960's	60
6	Hazardous Waste Storage Area	1981-Present	58
7	Landfill No. 2	1965-early 1970's	55
8	Storm Drainage System	1942-Present	53
9	South Edge of Concrete Apron	Prior to 1970	52
10	Vehicle Maintenance Facility, Rear	Prior to 1977	49
11	Low Level Radioactive Disposal Site	Prior to 1970	44

- Landfill No. 1
- JP-4 Spill Site
- Defueling Pit Leak
- Fuel-Contaminated Soil
- Fire Protection Training Area
- Hazardous Waste Storage Area
- Landfill No. 2
- Storm Drainage System
- South Edge of Main Apron

The areas determined to have an insufficient potential for environmental contamination to warrant further investigation are as follows:

- Vehicle Maintenance Facility
- Low Level Radioactive Disposal Site

RECOMMENDATIONS

The recommendations developed for further assessment of environmental concern areas at O'Hare ARFF are presented below.

Landfill No. 1

Conduct geophysical survey to define the landfill boundaries and depth and identify any leachate plume. Based on the results of the geophysical survey, install one upgradient and 3 down gradient monitoring wells. Wells should be constructed using 3" Schedule 40 PVC, screened into the first sand and gravel lens (20' to 30' deep). Sample these wells and analyze for pH, total dissolved solids, total organic halogens, total organic carbon and phenol.

JP-4 Tank Dike Spill

Conduct geophysical survey around the tank farm to identify any JP-4 plume. Conduct a continuous core sampling in the dike area extended to the first sand and gravel lens. Observe if any JP-4 is present. Perform a water extract on 3 soil samples and analyze for oil and grease and total organic halogen.

Fuel-Contaminated Soil

Conduct geophysical survey around the site to identify any JP-4 plume. Conduct a continuous core sampling near the site extended to the

first sand and gravel lens (20'-30' deep). Observe if any JP-4 is present. Perform a water extract on 3 soils samples and analyze for oil and grease, and total organic carbon.

Defueling Pit Leak Site

Conduct geophysical survey around the site to identify any JP-4 plume. Conduct a continuous core sampling near the site extended to the first sand and gravel lens (20'-30' deep). Observe if any JP-4 is present. Perform a water extract on 3 soil samples and analyze for oil and grease, and total organic carbon.

Fire Protection Training Area

Conduct geophysical survey around the site to identify any leachate plume.

Hazardous Waste Storage Area

Conduct a continuous core sampling in the center of the site extended to the first sand and gravel lens (20'-30' deep). Observe if contamination present. Perform a water extract of 3 selected soil samples (in contaminated zones if present) and perform analyses for pH, total organic halogen and total organic carbon.

Landfill No. 2

Conduct geophysical survey to define the landfill boundaries and depth and identify any leachate plume. Based on the results of the geophysical survey, install one upgradient and two downgradient monitoring wells. Wells should be constructed of 3" Schedule 40 PVC, screened into the first sand and gravel lens (20'-30' deep). Sample these wells and analyze for pH, total organic carbon, total organic halogen, total dissolved solids and phenols.

Storm Drainage System Near Hangars

Conduct continuous core sample at the nearest wooden pipe section and at the nearest outfall extended to the first sand and gravel lens. Observe if contamination is present. Perform a water extraction of 3 samples and analyze for total organic halogen, total organic carbon and pH.

Spills along South Edge of Main Apron

Conduct a continuous core sampling at the edge of the apron extended to the first sand and gravel lens (20'-30' deep). Observe if any contamination present. Perform a water extract on 3 selected soil

samples (in contaminated zones if present) and perform analyses for pH, total organic halogen and total organic carbon.

SECTION 1

INTRODUCTION

BACKGROUND

The United States Air Force, due to its primary mission, has long been engaged in a wide variety of operations dealing with toxic and hazardous materials. Federal, state, and local governments have developed strict regulations to require that disposers identify the locations and contents of past disposal sites and take action to eliminate hazards in an environmentally responsible manner. The primary Federal legislation governing disposal of hazardous waste is the Resource Conservation and Recovery Act (RCRA) of 1976, as amended. Under Section 6003 of the Act, Federal agencies are directed to assist the Environmental Protection Agency (EPA) and under Section 3012, state agencies are required to inventory past disposal sites and make the information available to the requesting agencies. To assure compliance with these hazardous waste regulations, the Department of Defense (DOD) developed the Installation Restoration Program (IRP). The current DOD IRP policy is contained in Defense Environmental Quality Program Policy Memorandum (DEQPPM) 81-5, dated 11 December 1981 and implemented by Air Force message dated 21 January 1982. DEQPPM 81-5 reissued and amplified all previous directives and memoranda on the Installation Restoration Program. DOD policy is to identify and fully evaluate suspected problems associated with past hazardous contamination, and to control hazards to health and welfare that resulted from these past operations. The IRP will be the basis for response actions on Air Force installations under the provisions of the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) of 1980, and clarified by Executive Order 12316.

PURPOSE AND SCOPE OF THE ASSESSMENT

The Installation Restoration Program has been developed as a four-phased program as follows:

Phase I	- Initial Assessment/Records Search
Phase II	- Confirmation and Quantification
Phase III	- Technology installation Development
Phase IV	- Operations/Remedial Actions

Engineering-Science (ES) was retained by the United States Air Force to conduct the Phase I Records Search at O'Hare Air Reserve Forces Facility (ARFF), Contract No. F08637-80-R0009. This report contains a summary and an evaluation of the information collected during Phase I of the IRP and recommendations for follow on actions.

The goal of the first phase of the program was to identify the potential for environmental contamination from past waste disposal practices at O'Hare ARFF, and to assess the potential for contaminant migration. The activities that were performed in the Phase I study included the following:

- Review of installation records
- Interview of personnel familiar with past generation and disposal activities
- Survey of wastes
- Determination of estimated quantities and locations of current and past hazardous waste treatment, storage, and disposal
- Definition of the environmental setting at the installation
- Review of past disposal practices and methods
- Field inspection of installation facilities
- Collection of pertinent information from Federal, state and local agencies
- Assessment of potential for contaminant migration
- Development of follow-on recommendations.

ES performed the on-site portion of the records search during August 1983. The following team of professionals were involved:

- D. L. Gregory, Environmental Engineer and Project Manager, MSCE, 5 years of professional experience
- H. D. Harmon, Hydrogeologist, 9 years of professional experience
- R. J. Reimer, Chemical Engineer, 4 years of professional experience

More detailed information on these three individuals is presented in Appendix A.

METHODOLOGY

The methodology utilized in the O'Hare ARFF Records Search began with a review of past and present industrial operations conducted at the installation. Information was obtained from available records and files, as well as interviews with past and present installation employees from the various operating areas. Those interviewed included - current and past personnel associated with Civil Engineering, Consolidated Aircraft Maintenance, Base Supply, and the Base Clinic. A listing of the installation interviewees by position and approximate years of service is presented in Appendix B.

Concurrent with the installation interviews, the applicable Federal, state and local agencies were contacted for pertinent installation-related environmental data. The agencies contacted and interviewed are listed below and additional information is included in Appendix B.

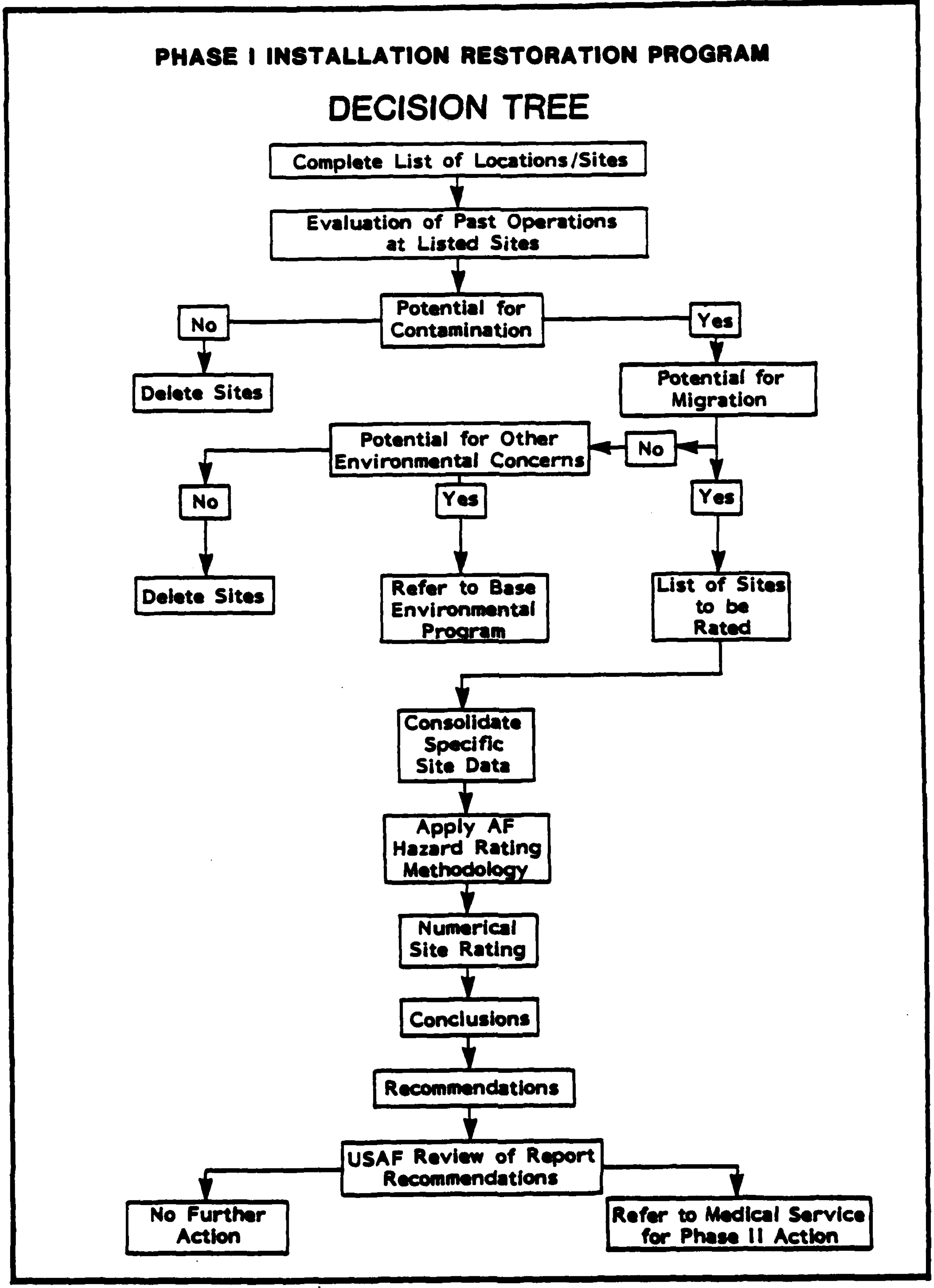
- o U.S. Environmental Protection Agency (EPA), Region V
- o U.S. Geological Survey (USGS), Water Resources Division
- o Illinois Environmental Protection Agency
- o Illinois Department of Conservation
- o Illinois Department of Energy and Natural Resources, State Water Survey Division
- o City of Chicago, Department of Aviation

The next step in the activity review was to determine the past management practices regarding the use, storage, treatment, and disposal of hazardous materials from the Air Force operations at the installation. Included in this part of the activities review was the identification of all known past disposal sites and other possible sources of contamination such as spill areas.

A general ground tour of the identified sites was then made by the ES Project Team to gather site-specific information including: (1) visual evidence of environmental stress; (2) the presence of nearby drainage ditches or surface water bodies; and (3) visual inspection of these water bodies for any obvious signs of contamination or leachate migration.

A decision was then made, installationd on all of the above information, whether a potential exists for hazardous material contamination at any of the identified sites using the Decision Tree shown in Figure 1.1. If no potential existed, the site was deleted from further consideration. For those sites where a potential for contamination was identified, a determination of the potential for migration of the contamination was made by considering site-specific conditions. If there were no further environmental concerns, then the site was deleted. If the potential for contaminant migration was considered significant, then the site was evaluated and prioritized using the Hazard Assessment Rating Methodology
(HARM). A discussion of the HARM system is presented in Appendix G. The sites that were evaluated using the HARM procedures were also reviewed with regard to future land use restrictions.

FIGURE 1.1


PHASE I INSTALLATION RESTORATION PROGRAM
DECISION TREE
Complete List of Locations/Sites
Evaluation of Past Operations at Listed Sites
Potential for Contamination
No
Yes
Delete Sites
Potential for Migration
Potential for Other Environmental Concerns
No
No
Yes
Yes
Delete Sites
Refer to Base Environmental Program
List of Sites to be Rated
Consolidate Specific Site Data
Apply AF Hazard Rating Methodology
Numerical Site Rating
Conclusions
Recommendations
USAF Review of Report Recommendations
No Further Action
Refer to Medical Service for Phase II Action

SECTION 2
INSTALLATION DESCRIPTION

LOCATION, SIZE AND BOUNDARIES

O'Hare Air Reserve Forces Facility at O'Hare International Airport is located in the Chicago metropolitan area in northeastern Illinois (Figures 2.1 and 2.2). The airport is located northwest of downtown Chicago at the boundary of Cook County and DuPage County. All of the property around the airport and Air Force installation is urbanized and used for residential, commercial and/or industrial purposes. The military portion of O'Hare Airport is composed of approximately 400 acres of land in the northeast corner of the airport. The Air Force also leases a portion of the southeast taxiway. The Air Force has retained the priority use of all runways. Figure 2.3 depicts the configuration of the installation property.

INSTALLATION HISTORY

Initially called Orchard Place Airport, the site was activated in October of 1942, when the government acquired a number of tracts of farm land. The War Assets Corporation erected buildings on this land to be used for an aircraft assembly plant.

In June of 1943, the installation was leased to Douglas Aircraft Company as an assembly plant for the C-54 cargo aircraft. The site was known as the "Chicago Aircraft Assembly Plant Number 8." During the years of 1943 to 1945, approximately 665 aircraft were assembled and delivered to the Army Air Corps. The plant was then closed in the fall of 1945.

In 1946, the site was reactivated as a military installation when the 803rd Army Air Force Reserve Specialized Depot assumed control of the site. During this time, the 141st Air Force installation unit for reserve training was activated at the renamed Douglas-Orchard Airport.

In 1948, the 141st was replaced by the 2471st AF Reserve Combat Training Center. In 1949, both the 437th and the 441st Troop Carrier

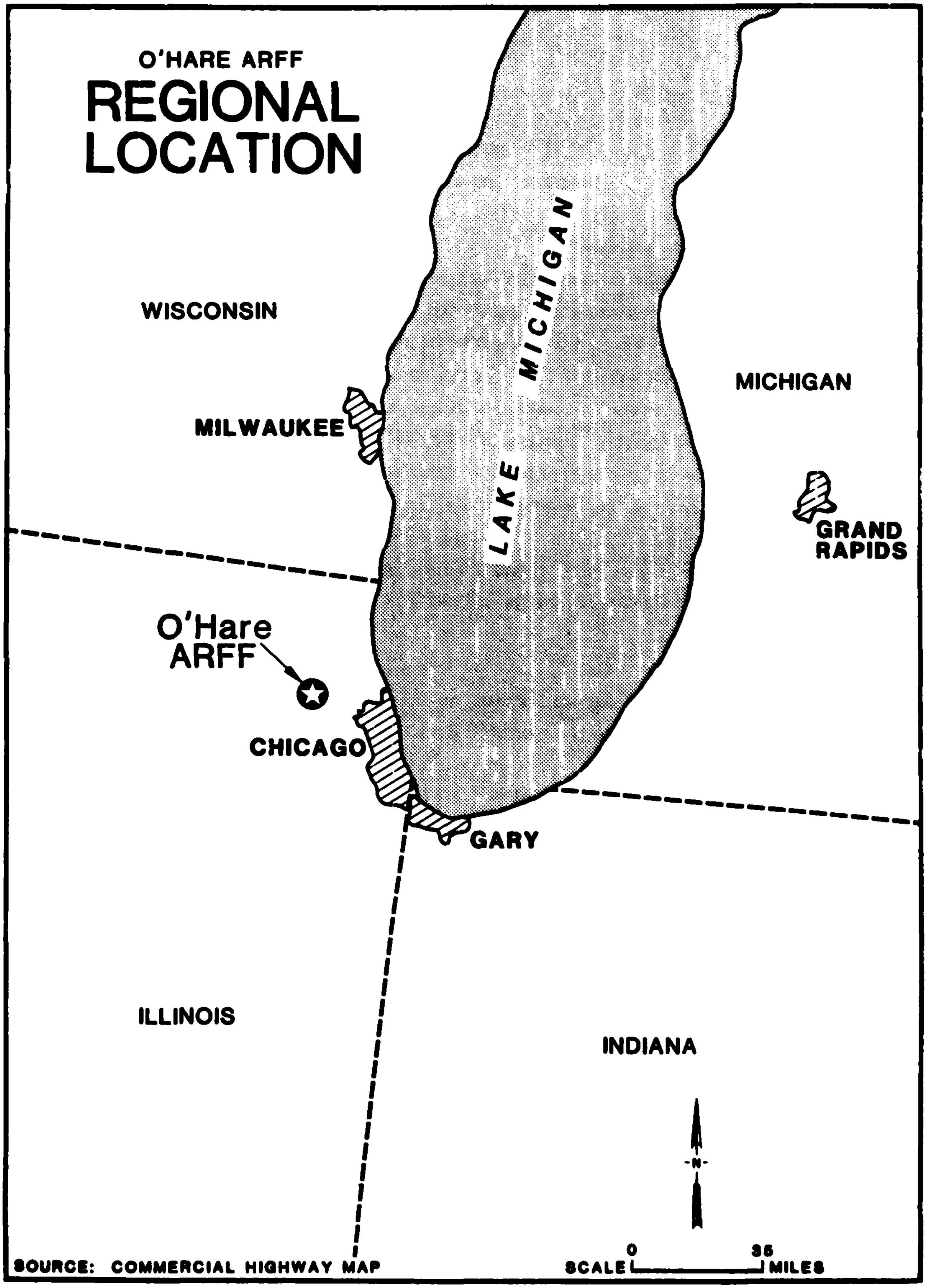
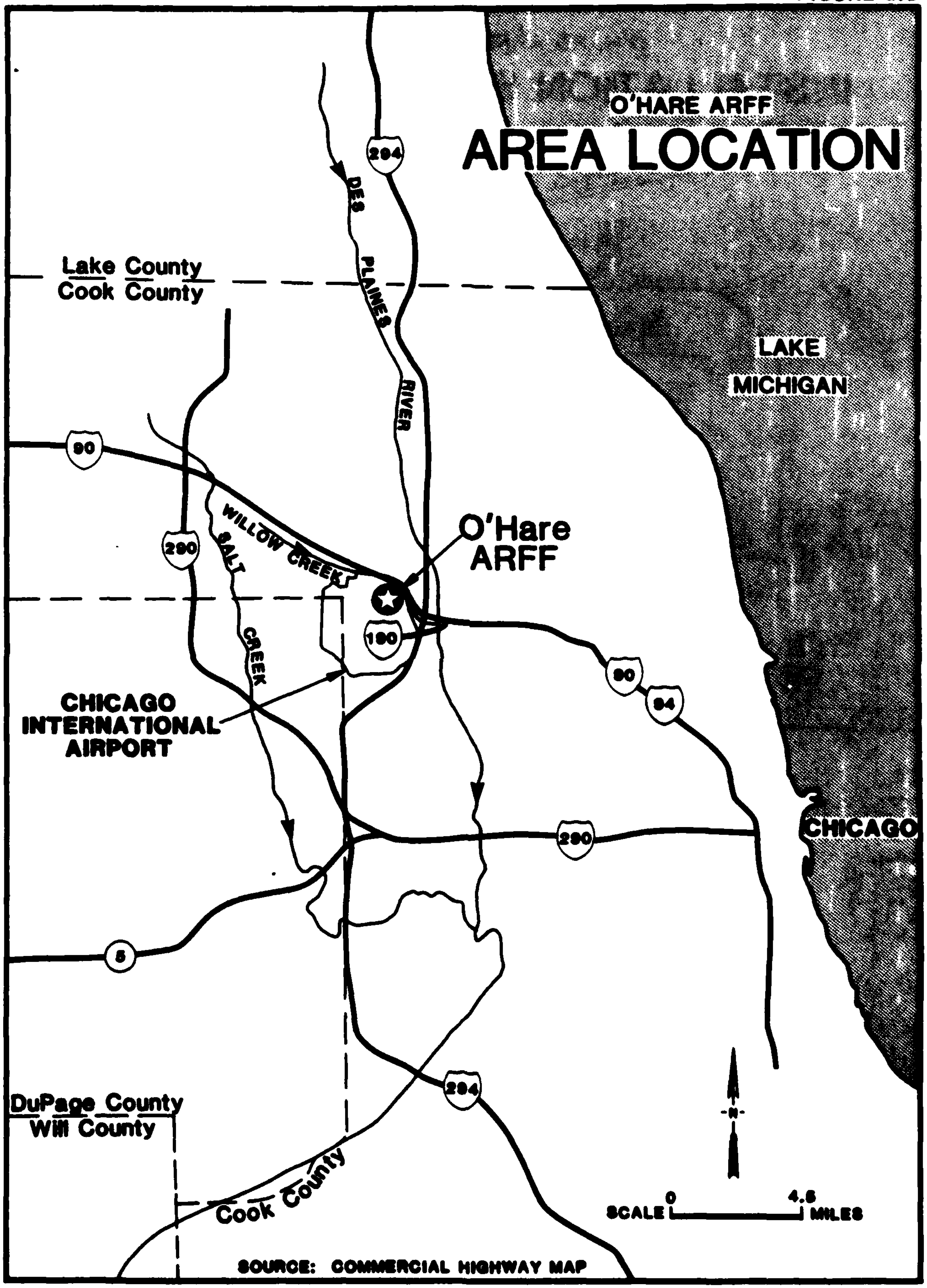
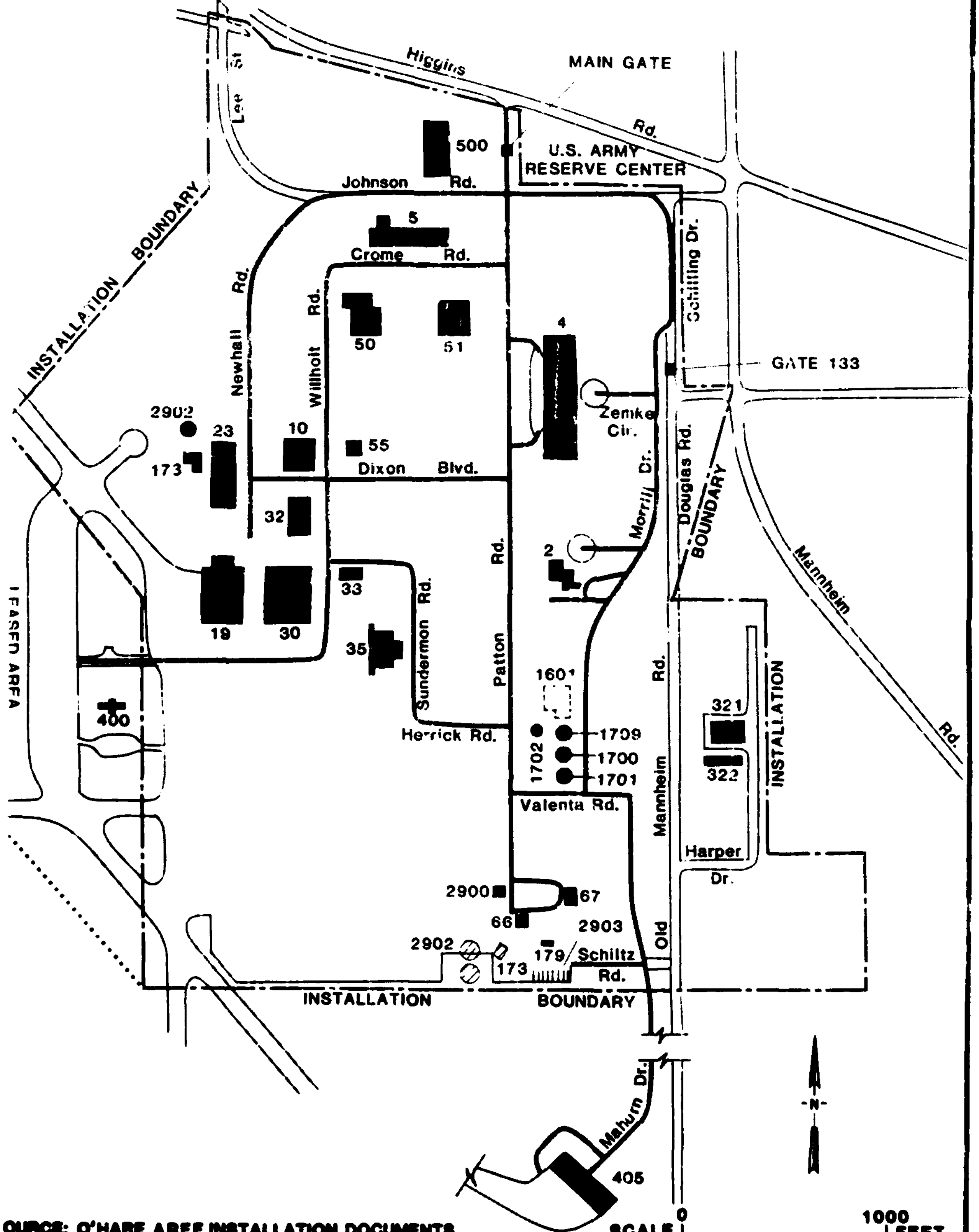

O'HARE ARFF
REGIONAL LOCATION
WISCONSIN
LAKE MICHIGAN
MICHIGAN
MILWAUKEE
GRAND RAPIDS
O'Hare ARFF
CHICAGO
GARY
ILLINOIS
INDIANA
N
SOURCE: COMMERCIAL HIGHWAY MAP
SCALE 0 35 MILES

FIGURE 2.2


O'HARE ARFF
AREA LOCATION
Lake County
Cook County
LAKE
MICHIGAN
DES PLAINES RIVER
294
90
WILLOW CREEK
SALT CREEK
290
O'Hare
ARFF
190
94
CHICAGO
INTERNATIONAL
AIRPORT
CHICAGO
290
5
294
DuPage County
Will County
Cook County
N
SCALE 0 4.5 MILES
SOURCE: COMMERCIAL HIGHWAY MAP

O'HARE ARFF
INSTALLATION SITE PLAN



OURCE: O'HARE ARFF INSTALLATION DOCUMENTS

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Wings Reserve were activated. In 1949, the military portion was redesignated USAF O'Hare Field, Chicago International Airport.

From October 1950 until December 1957, the 2471st AFRCTC remained the supervisory unit. In 1955, the airfields were opened to commercial traffic.

From May 1957 until October 1970, the 928th Tactical Airlift Group was equipped with the Fairchild C-119 "Flying Boxcar", and in 1970 the Lockheed C-130A "Hercules" arrived. The 928th TAG is still the installation's host unit.

ORGANIZATION AND MISSION

O'Hare ARFF at O'Hare International Airport has a fulltime staff of 1,544 employees. For one weekend per month and two full weeks per year, the installation serves as a training facility for approximately 2400 Air Force Reservists and Air National Guardsmen.

The host organization at O'Hare ARFF is the 928th Tactical Airlift Group (TAG). The primary mission of the 928th TAG is to provide individual and unit training in the C-130A, tactical airlift support for airborne forces, equipment, supplies and aeromedical evacuation within a theater of operations. Additionally, the Group operates and maintains the Air Force complex at O'Hare, represents the Air Force in the Chicago metropolitan area, and provides logistical support to various on/off installation tenants.

The on-installation tenants at the O'Hare ARFF are listed below. Descriptions of the major tenant and other installation organizations and their missions are presented in Appendix C.

- Defense Contract Administration Services Region
- Defense Logistics Agency
- Headquarters, Illinois Air National Guard (Ill ANG)
- 126th Air Refueling Wing, Ill ANG
- 126th Combat Support Group, Ill ANG
- 108th Air Refueling Squadron, Ill ANG
- 126th Consolidated Aircraft Maintenance Squadron, Ill ANG
- 126th USAF Clinic, Ill ANG
- 126th Civil Engineering Flight, Ill ANG

- 126th Communications Flight, Ill ANG
- 217th Electronics Installation Squadron, Ill ANG
- 264th Communications Squadron, Ill ANG
- 566th USAF Band, Ill ANG
- USAF Liaison Office/National Scouting Organization
- 36th Medical Service Evacuation Squadron
- Aeronautical Systems Division, Reserve Detachment (AFLC)
- Corps of Engineers Field Office

SECTION 3

ENVIRONMENTAL SETTING

The environmental setting of O'Hare Air Reserve Forces Facility (ARFF) is described in this section with an emphasis on the identification of natural features that may promote the movement of hazardous waste contaminants. Environmental conditions pertinent to this study are summarized at the conclusion of this section.

METEOROLOGY

Two climatic features of interest in determining the potential for movement of contaminants are net precipitation and rainfall intensity. Net precipitation is an indicator for the potential of leachate generation and is equal to the difference between annual precipitation and annual evaporation. Rainfall intensity is an indicator for the potential of excessive runoff and erosion. The one-year, 24-hour rainfall event is used to gauge the potential for runoff and erosion.

Net precipitation at Chicago O'Hare ARFF is 4.2 inches as determined from meteorological records. Normal annual precipitation at O'Hare International Airport for the period 1958 to 1981 is 34.17 inches (National Oceanic and Atmospheric Administration (NOAA), 1981) and annual evaporation for the area is 30 inches (NOAA, 1977). This value of net precipitation indicates that there is some potential for leachate generation at hazardous waste sites on the installation as a result of rainfall. Selected meteorological data are summarized in Table 3.1.

The one-year, 24-hour rainfall event for the installation is 2.4 inches (NOAA, 1968). This value indicates that there is a moderate potential for erosion and transport of surface contamination from hazardous waste sites on the installation.

TABLE 3.1
SUMMARY OF METEOROLOGICAL DATA[1]

	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Temperature (°F)													
Mean	20.4	25.0	36.1	48.8	59.0	68.5	72.8	71.9	64.6	53.1	40.0	27.0	49.0
Precipitation (inches)													
Mean	1.64	1.30	2.60	3.87	3.26	4.19	3.50	3.63	3.86	2.05	2.12	2.15	34.17
Max. Monthly	4.11	2.70	5.91	6.28	7.14	7.94	5.27	8.54	11.44	6.55	4.74	5.37	11.44
Min. Monthly	0.10	0.12	0.63	0.97	1.61	1.68	1.18	0.51	0.02	0.16	0.65	0.23	0.02
Snowfall (inches)													
Max. Monthly	34.3	21.5	24.7	11.1	1.6	0.0	0.0	0.0	T[2]	6.6	10.4	35.3	35.3

(1) Based on the period 1958 to 1981
(2) Trace

GEOGRAPHY

The installation is located northwest of Chicago, Illinois in the Glaciated Central Region ground-water basin. The landscape of the region ranges from a low, flat plain east of the installation to a poorly drained hilly belt west of the installation. The area around the installation is highly urbanized.

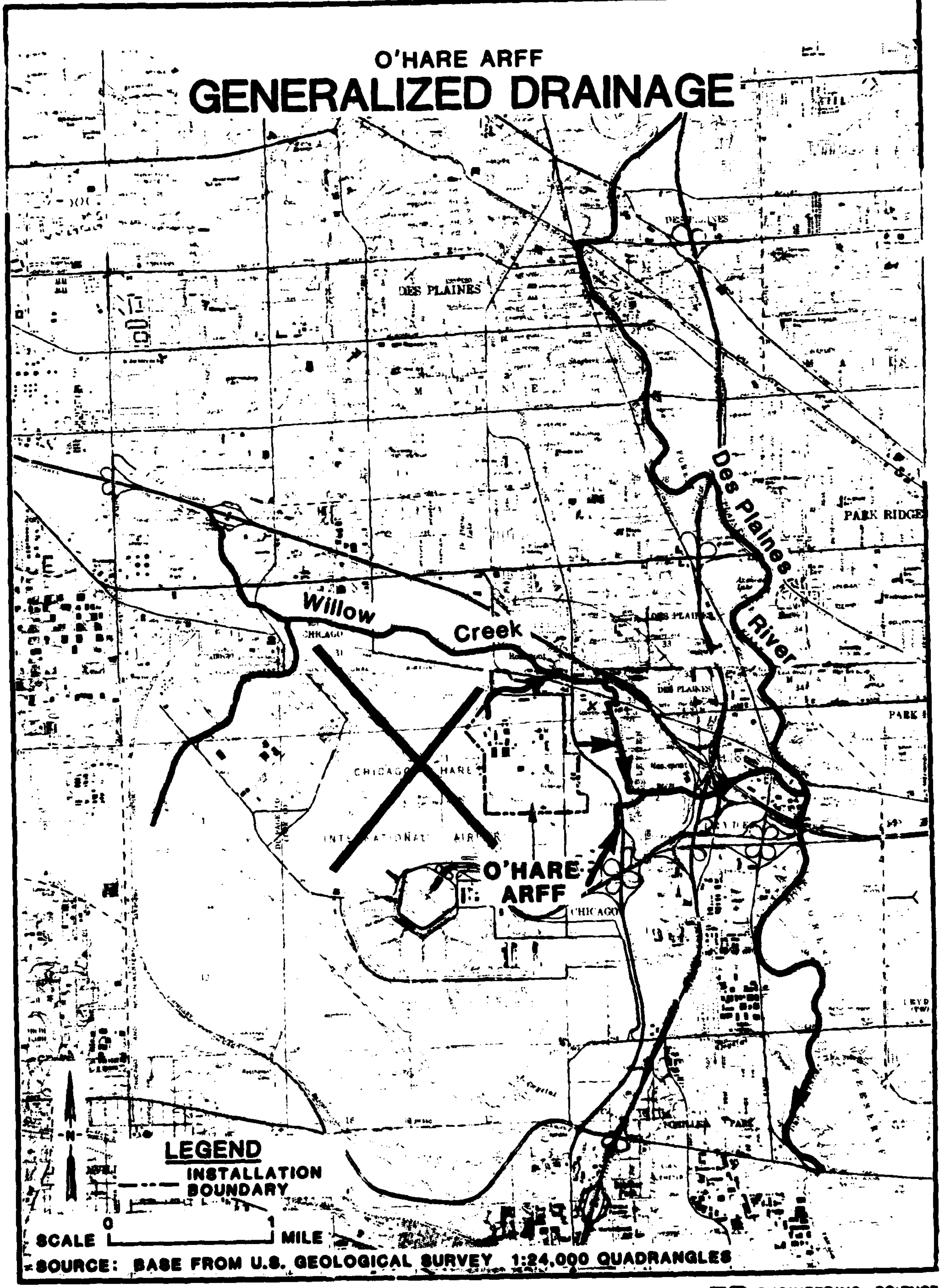
The installation is in the Des Plaines River drainage basin which is the major drainage basin in the area. The Des Plaines River originates near the Illinois-Wisconsin border approximately 30 miles north of the installation. The river empties into the Illinois River approximately 50 miles south of the installation. The river flows generally south in the vicinity of the installation (Figure 3.1).

Topography and Drainage

The topography at O'Hare ARFF slopes very gently to the northeast. The highest point on the installation is about 650 feet mean sea level (MSL). This point occurs along the western border of the installation near runway 22R. The lowest point is approximately 635 feet MSL and occurs along a drainage ditch near the installation's northern boundary.

Open drainage ditches traverse the northwest and north ends of the installation (Figure 3.2). One drainage ditch flows east near the northern boundary of the installation. This drainage ditch enters the installation near the end of runway 22R. The drainage ditch exits the installation under Higgins Road near the installation main gate and flows into Willow Creek. A second drainage ditch flows north along the northwest boundary of the installation and discharges into the eastward flowing drainage ditch. Overland runoff from the northwest corner of the installation discharges to these drainage ditches. Storm drainage from the northern end of O'Hare International Airport drains into the eastward flowing drainage ditch which traverses the northwest corner of the installation.

Storm drainage from the installation discharges to Willow Creek, a tributary of the Des Plaines River. Storm drains on the installation direct storm runoff to an open ditch that begins at Mannheim Road east of the installation. The open ditch drains east about 1,300 feet to Willow Creek. The relationship between Willow Creek and installation drainage structures is shown on Figure 3.2.



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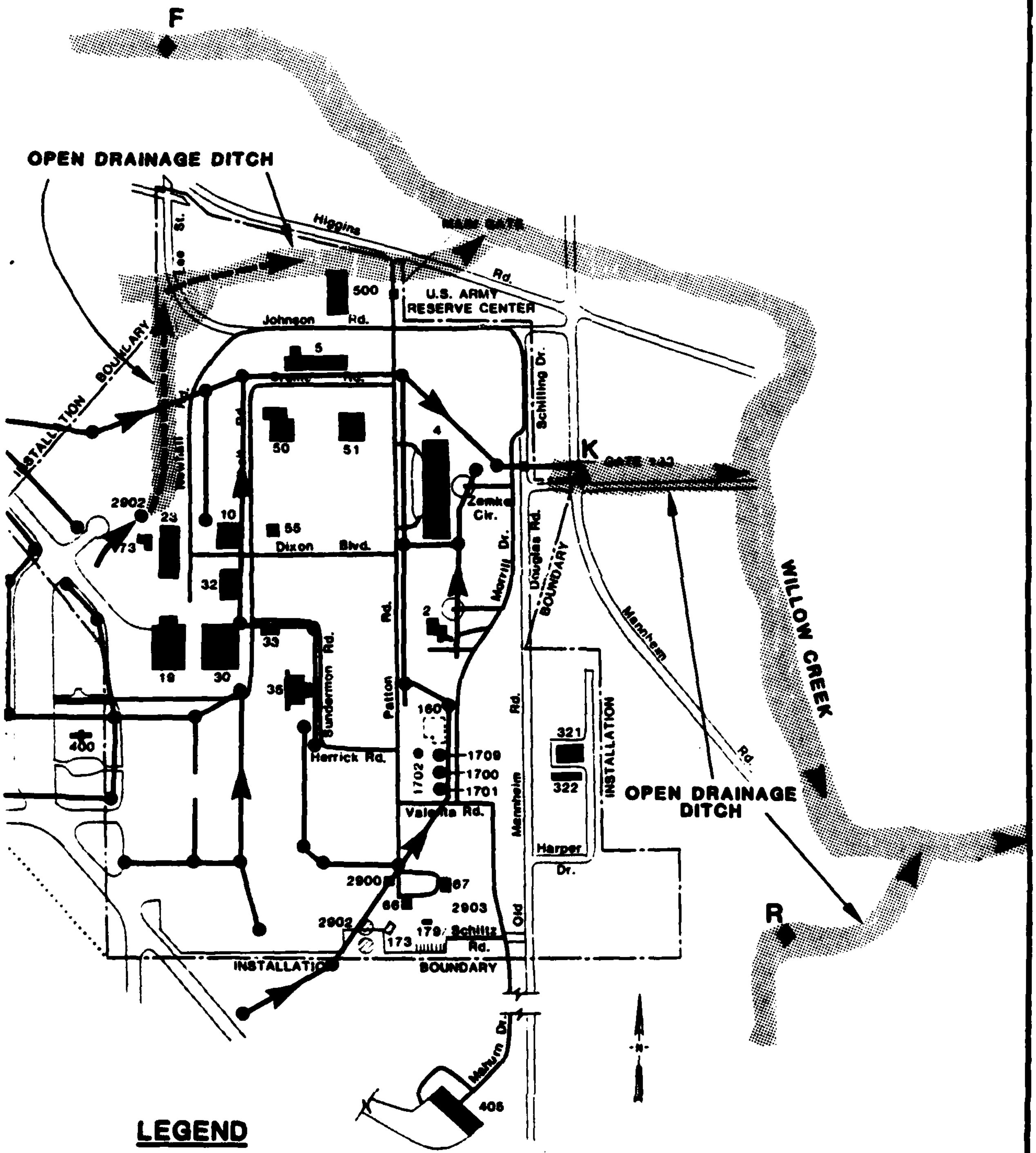
O'HARE ARFF

STORM DRAINAGE AND WATER QUALITY MONITORING SITES



LEGEND

◆ WATER QUALITY MONITORING SITE

—●—●➤ STORM DRAINAGE AND DIRECTION OF FLOW

OURCE: O'HARE ARFF INSTALLATION DOCUMENTS

SCALE 0 — 1000 FEET

GEOLOGY

Stratigraphy

O'Hare ARFF is underlain by rocks of Precambrian age and younger and unconsolidated glacial deposits. A stratigraphic column representing the sequence of rocks in the area is given in Table 3.2.

Dense crystalline rock of Precambrian age forms the installationment upon which younger geologic units were deposited. The depth below land surface to these rocks is probably greater than 4,000 feet at the installation. The only well in the Chicago area known to penetrate the Precambrian was drilled approximately 6 miles west of Joliet, Illinois. (Bradbury and Atherton, 1965).

A layered sequence of gently eastward dipping sedimentary rocks of Cambrian and Ordovician age overlie the Precambrian rocks. These rocks are mainly sandstone and dolomite and are probably greater than 3,000 feet thick at the installation. (Hughes and others, 1966). The Ordovician age rocks have a combined thickness of about 800 feet in the vicinity of the installation.

Silurian age dolomite overlies the Ordovician rocks and is the upper bedrock unit at the installation. This unit is mostly dense dolomite with many joints and solution channels. It's thickness is about 135 feet in the vicinity of the installation.

The thickness of the Ordovician and Silurian rocks were derived from a drilling log for a well that was drilled for the Twin Orchard Country Club prior to the existence of the airport. This well was drilled in 1925 to a total depth of 1,410 feet. The approximate well location is shown on Figure 3.3.

Unconsolidated glacial deposits of Quaternary age overlie the bedrock to a thickness of 70 to 85 feet at the installation (Figure 3.4). These deposits consist of stratified clay, sand and gravel. The deposits appear to thicken toward the north end of the installation.

The surficial deposits at the installation are mostly artificial fill underlain by clay. The composition of unconsolidated deposits near the surface is described in Table 3.3.

TABLE 3.2
GENERALIZED STRATIGRAPHY

System	Group or Formation	Thickness	Lithology
Quaternary		70-85	Clay, sand and gravel, till
Silurian	Niagara Dolomite Alexandrian Series	135	Dolomite
Ordovician	Maquoketa Shale	230	Shale
	Galena Dolomite Decorah Formation Platteville Formation	320	Dolomite
	Glenwood Formation St. Peter Sandstone	145	Sandstone, fine to coarse grained
	Prairie du Chien Group	95	Dolomite
Cambrian	Trempealeau Formation	125	Dolomite
	Franconia Formation	90	Dolomite and sandstone
	Ironton Sandstone Galesville Sandstone	200+	Sandstone, fine to medium grained
	Eau Claire Formation	235-450	Shale and siltstone
	Mt. Simon Sandstone	2000±	Sandstone, coarse grained

Precambrian crystalline rocks

O'HARE ARFF

LOCATIONS FOR GEOLOGIC DATA

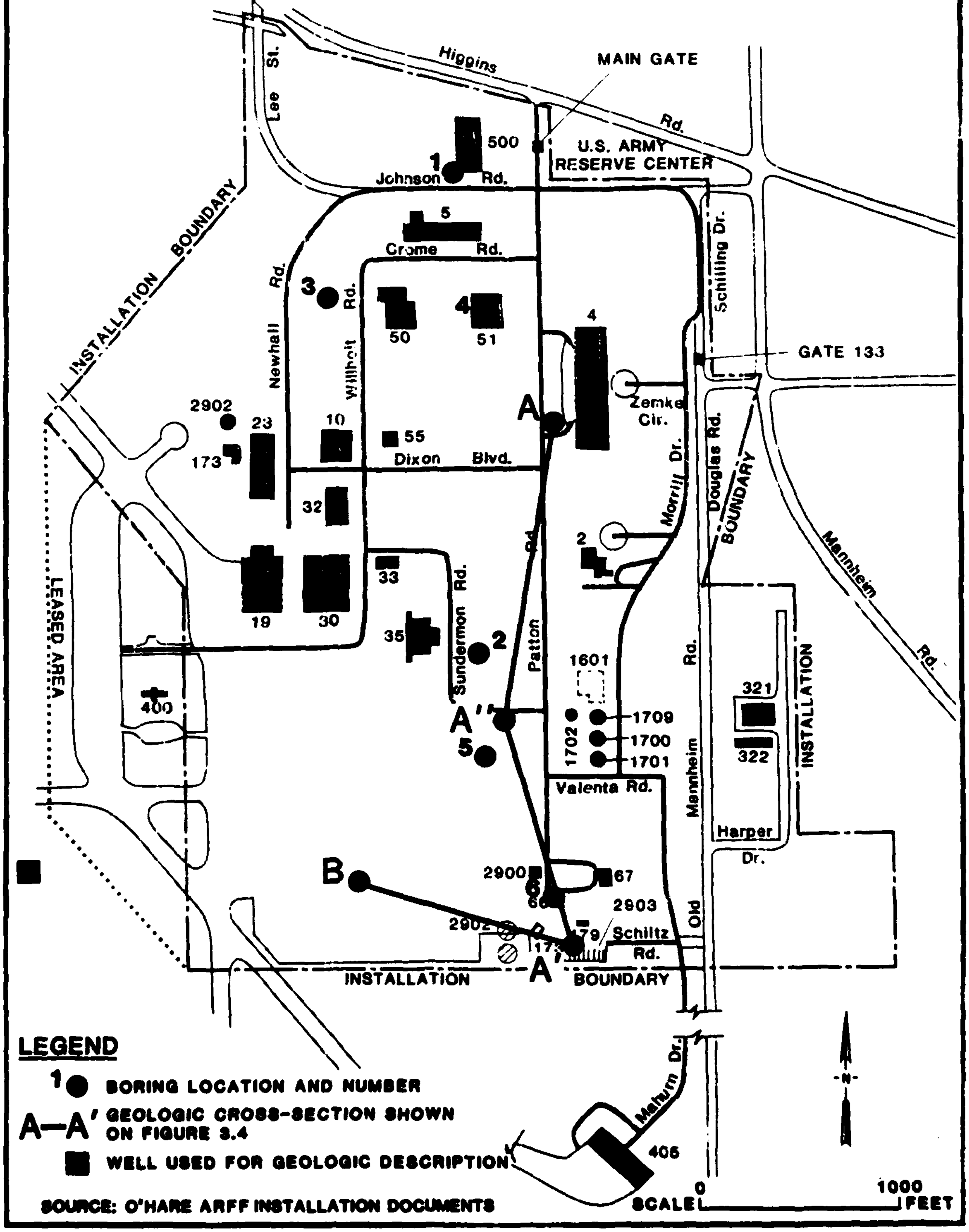


FIGURE 3.4

O'HARE ARFF
GENERALIZED GEOLOGIC CROSS-SECTIONS

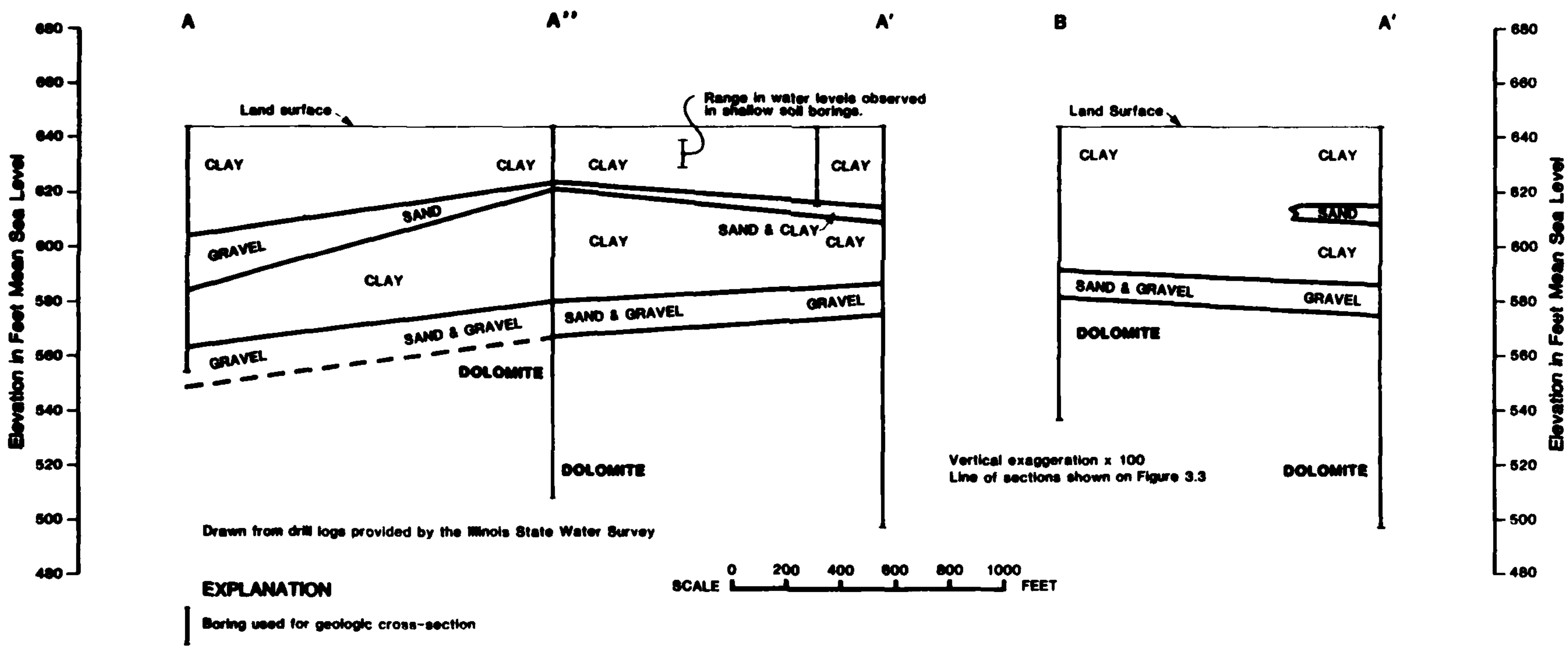


TABLE 3.3
SUMMARY OF SELECTED SOIL BORINGS

Boring No.	Other Boring I.D.	Boring Depth (Feet)	Lithology
1	DH77-1	0 - 1.5	Top soil
		1.5 - 7.0	Clay, brown
		7.0 - 11.0	Clay, brown and gray
		11.0 - 18.0	Clay, gray, trace sand and gravel
		18.0 - 20.0	Sandy silt
2	DH77-18	0 - 3.0	Fill, concrete and sand
		3.0 - 9.0	Clay, brown and gray
		9.0 - 14.5	Clay, gray
		14.5 - 22.0	Sandy clay, gray
3	DH80-8	0 - 1.0	Fill, concrete
		1.0 - 2.5	Sandy clay, brown
		2.5 - 4.0	Clay, dark gray
		4.0 - 18.0	Clay, gray
		18.0 - 22.0	Silty sand
		22.0 - 29.0	Clay, gray, with sand and gravel
4	-	0 - 6.0	Fill
		6.0 - 8.5	Silty clay, brown and gray
		8.5 - 18.5	Silty clay, trace of gravel
		18.5 - 23.5	Silt, some sand layers
		23.5 - 25.0	Silty clay, trace sand and gravel
5	DH75-1	0-0.5	Fill
		0.5 - 8.0	Clay, brown
		8.0 - 15.0	Clay, grades from brown to gray
		15.0 - 24.0	Clay, with silt and sand layers
		24.0 - 25.0	Sand clay
6	DH75-7	0-1.0	Fill
		1.0 - 15.0	Clay, tan to brown, slightly sandy
		15.0 - 18.0	Clay, gray
		18.0 - 29.0	Sandy clay
		29.0 - 31.0	Silty sand

Modified from O'Hare ARFF drawings
Boring locations shown on Figure 3.3

Structure

The Chicago area is located near the crest of a broad, gently sloping arch composed mostly of Cambrian, Ordovician and Silurian rocks. The longitudinal axis of this arch runs generally in a northwest-southeast direction. The rocks have a general eastward dip that results from the eastward plunge of the arch.

The major structural feature near the installation is the Des Plaines Disturbance. Rocks in the area of the Disturbance are intensely faulted. The origin of the faulting is unknown but has been speculated to have been caused by a meteorite impact (Willman, 1971). The area of the Des Plaines Disturbance is approximately five-miles square. The southern end of the Disturbance is located approximately one-mile north of the installation.

HYDROLOGY

Subsurface Hydrology

There are four major aquifer systems in the vicinity of O'Hare ARFF. These aquifer systems are sand and gravel deposits of the glacial drift, shallow dolomites composed mostly of Silurian age rocks, the Cambrian-Ordovician aquifer system and the Mt. Simon aquifer. The glacial drift and shallow dolomite aquifers are separated from the underlying deeper aquifers by the Maquoketa Shale.

The glacial drift and shallow dolomite are of greatest interest for this study. These are the uppermost geologic units at the installation.

The glacial drift and shallow dolomite are both recharged locally from precipitation and are hydrologically connected in the Chicago area (Suter, 1959). The hydrologic connection is generally good whenever sand and gravel directly overlies the dolomite. This situation exists at O'Hare ARFF (Figure 3.4).

The glacial drift in the vicinity of the installation has an average vertical hydraulic conductivity, or permeability, on the order of 0.005 gallons per day per square foot (2.4×10^{-7} centimeters per second). This estimate assumes that recharge through the drift averages 140,000 gallons per day per square mile and that recharge is occurring

under a unit hydraulic gradient. These assumptions appear reasonable based on work done by Walton (1965) in DuPage county that is immediately west of the installation. This permeability estimate indicates that percolation to the water table of the installation is low.

Ground-water elevations and ground-water flow directions in the shallow dolomite are not known at the installation. Water levels in borings completed in the shallow dolomite on the installation stood at an elevation of 625 to 630 feet mean sea level in 1942. This water level was 15 to 20 feet below land surface. Water levels in the shallow dolomite were generally greater than 50 feet below land surface in DuPage County west of the installation in 1965 (Walton, 1965).

The unconsolidated deposits are saturated in part at the installation (Figure 3.4). Water levels have been observed 5 to 15 feet below land surface in shallow soil borings drilled on the installation between 1975 and 1980 for foundation investigations.

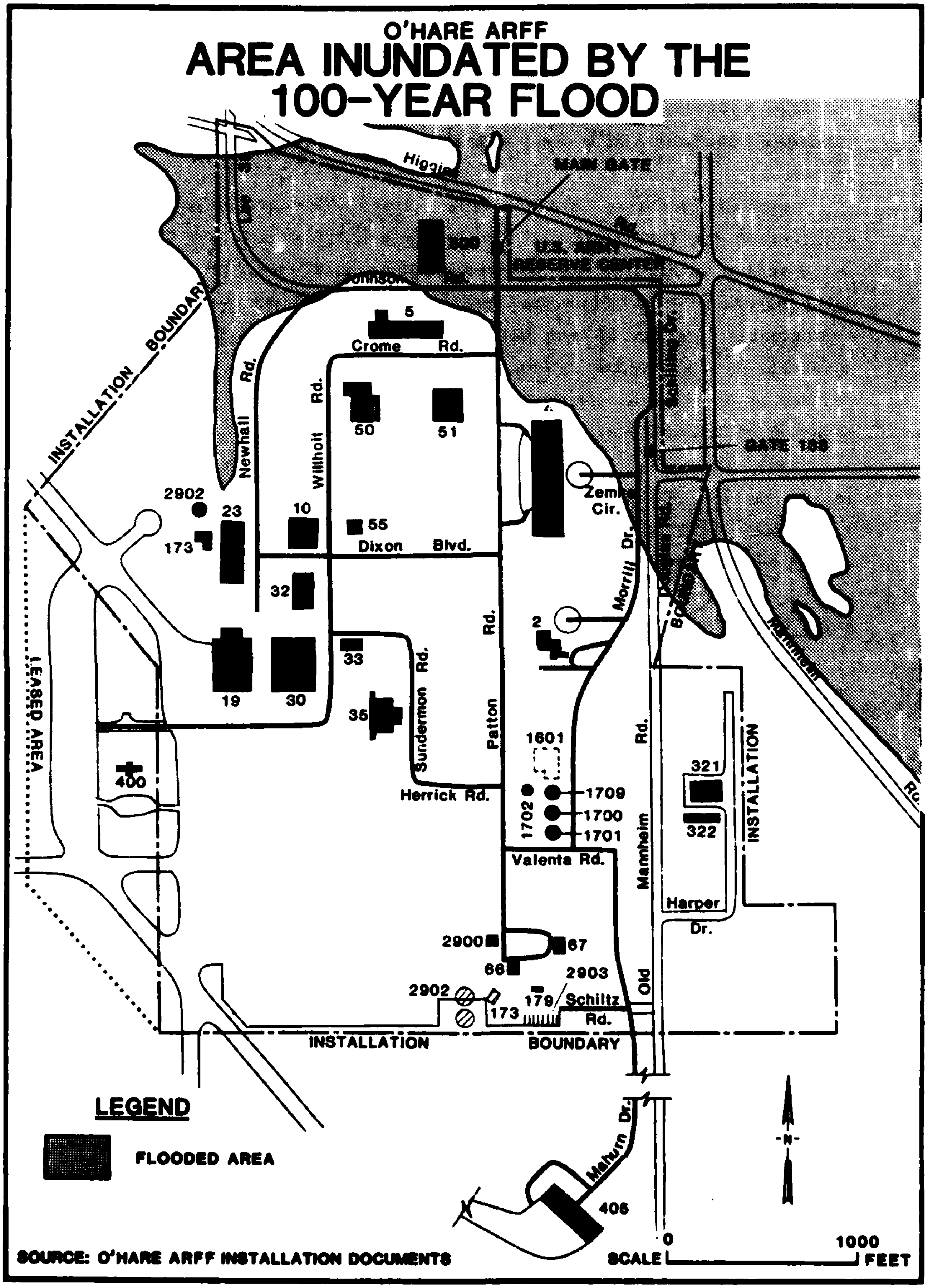
There is a potential for contamination of ground water to occur at subsurface waste disposal sites on the installation. The glacial deposits are at least periodically saturated at depths of 5 feet and more below land surface. Waste material buried to depths of 5 feet or more would be periodically saturated and could create leachate. Also, there would be a tendency for the leachate to move downward to the shallow dolomite aquifer.

Surface Hydrology

O'Hare ARFF is in the Willow Creek drainage basin. The installation is drained by a combination of open channels and drainage structures that discharge to the creek (Figure 3.2). The main stem of Willow Creek does not traverse the installation.

Periodic flooding can be expected at the north end of the installation. These floodwaters originate mostly as runoff from O'Hare International Airport and from the urbanized area west and north of the airport. The approximate limits of flooding for the 100-year flood event are shown on Figure 3.5.

FIGURE 3.5



ES ENGINEERING-SCIENCE

WATER USE

The installation receives its water supply from the City of Chicago. Surface and ground waters are not used for installation supply.

Numerous industrial and municipal supply wells are located in the vicinity of the installation. Most wells are 1,000 to 2,000 feet deep and withdraw water from the Cambrian-Ordovician aquifer system. A few wells withdraw water from the shallow dolomite aquifer system. The approximate location of the wells that could be identified from the available data are shown on Figure 3.6. (Six water supply wells are not plotted on the figure; insufficient data were available to determine the location of the wells within the section.)

Some residential wells exist in the vicinity of the installation (R. T. Sasman, Illinois State Water Survey, oral communication, 1983). The closest well completed in the shallow dolomite is located approximately one and one-half miles east of the installation.

WATER QUALITY

Surface water quality is monitored in the Willow Creek watershed by personnel employed by the airport facility. (Landrum and Brown, 1983). The parameters monitored include biochemical oxygen demand (BOD), pH, suspended solids, total dissolved solids, fats, oil and grease, dissolved oxygen and hexane solubles. The locations of the monitoring sites (F, K and R) in the vicinity of the installation are shown on Figure 3.2 and the monitoring results for the period November 1981 to October 1982 are summarized in Table 3.4. Runoff from the installation is monitored at site K.

The results of water quality monitoring indicates that water discharging to the creek from the installation does not meet all NPDES/-Illinois Environmental Protection Agency (IEPA) standards. (Landrum and Brown, 1983). Suspended solids in the water generally exceeded standards and fats, oil and grease in the water have exceeded standards.

Water quality parameters in other surface waters nearby also exceed IEPA standards (Table 3.4). Discharge standards are generally exceeded in Willow Creek at site F above the confluence with the installation drainage ditch and at site R in a drainage ditch that discharges to

FIGURE 3.6

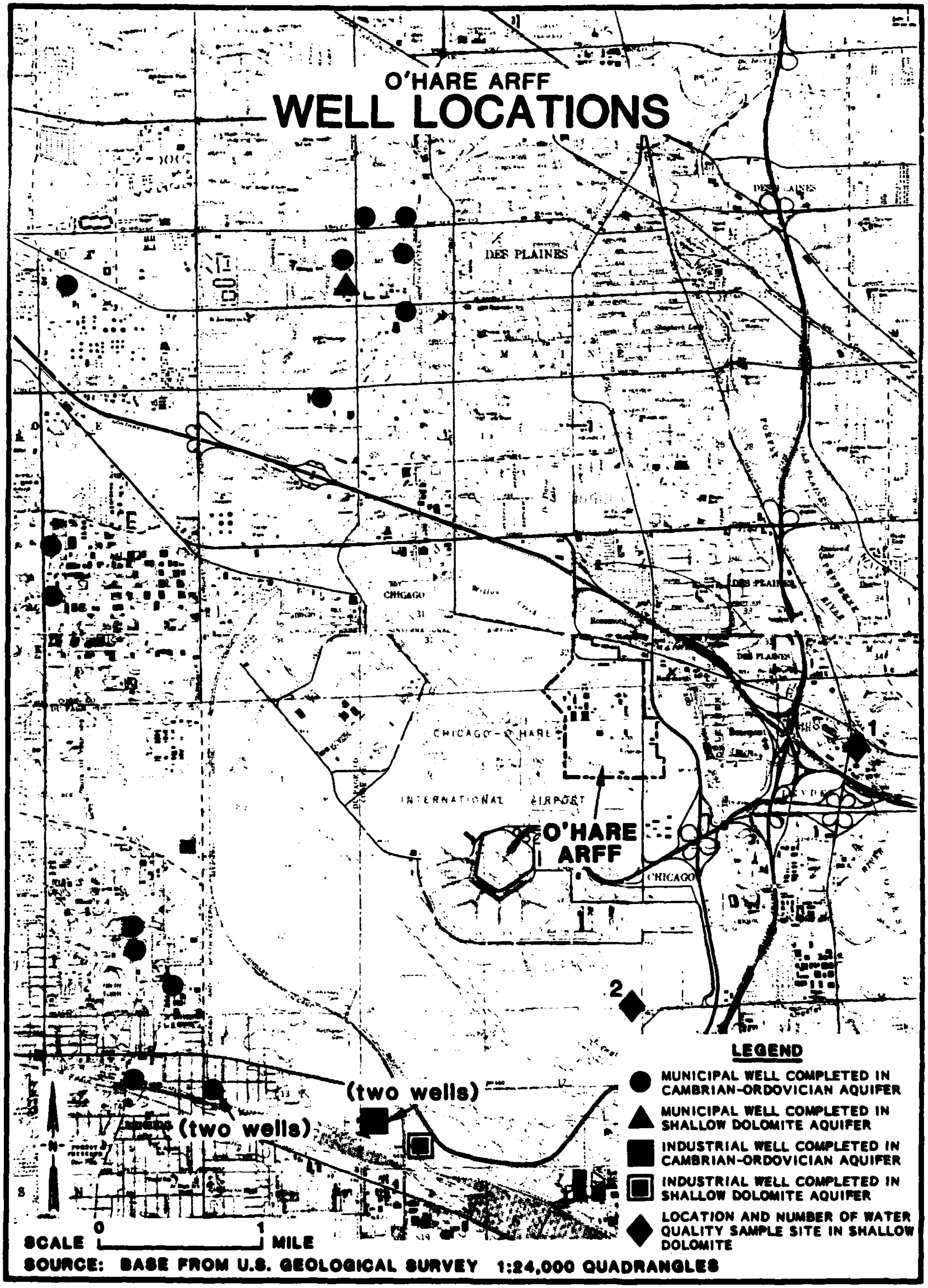

O'HARE ARFF
WELL LOCATIONS
DES PLAINES
CHICAGO
CHICAGO-O'HARE
INTERNATIONAL AIRPORT
O'HARE ARFF
1
2
(two wells)
(two wells)
N
LEGEND
MUNICIPAL WELL COMPLETED IN CAMBRIAN-ORDOVICIAN AQUIFER
MUNICIPAL WELL COMPLETED IN SHALLOW DOLOMITE AQUIFER
INDUSTRIAL WELL COMPLETED IN CAMBRIAN-ORDOVICIAN AQUIFER
INDUSTRIAL WELL COMPLETED IN SHALLOW DOLOMITE AQUIFER
LOCATION AND NUMBER OF WATER QUALITY SAMPLE SITE IN SHALLOW DOLOMITE
SCALE 0 1 MILE
SOURCE: BASE FROM U.S. GEOLOGICAL SURVEY 1:24,000 QUADRANGLES

TABLE 3.4
SUMMARY OF SELECTED CHEMICAL ANALYSES FOR SURFACE WATERS
(Analyses in Milligrams Per Liter Unless Otherwise Noted)

Monitoring Site[3]	Time Period	BOD (30)[1]	pH (Std. Units) (6.0-9.0)[1]	Suspended Solids (15)[1]	Total Dissolved Solids (1'000)[2]	Fats, Oil and Grease (15)[1]	Dissolved Oxygen (5.0)[2]
F	Nov.1981-Dec.1981	A	-	X	A	-	-
	Jan.1982-Feb.1982	X	-	X	-	-	-
	Mar.1982-May 1982	X	-	X	X	X	-
	June 1981-Aug.1982	X	-	X	X	X	-
	Sept.1982-Oct.1982	-	-	X	X	X	-
K	Nov.1981-Dec.1981	-	-	X	-	-	-
	Jan.1982-Feb.1982	-	-	X	-	-	-
	Mar.1982-May1982	-	-	X	-	X	-
	June 1982-Aug.1982	-	-	X	-	X	-
	Sept.1982-Oct.1982	-	-	X	-	-	-
R	Nov.1981-Dec.1981	-	-	X	X	-	-
	Jan.1982-Feb.1982	B	-	X	X	-	-
	Mar.1982-May 1981	X	-	X	X	-	-
	June 1982-Aug.1982	-	-	X	X	-	-
	Sept.1982-Oct.1982	X	-	X	X	X	-

X Exceeded NPDES/IEPA Standards during period

\- Did not exceed NPDES/IEPA Standards during period

A Exceeded NPDES/IEPA Standards on one test date

B Exceeded NPDES/IEPA Standards on two test dates

1 Minimum effluent standard (IEPA, 1982)

2 General use stream water quality standard (IEPA, 1982)

3 See Figure 3.2

Source: Landrum and Brown, 1983

Willow Creek downstream from the installation drainage ditch. Poor water quality is typical of highly urbanized areas.

Water quality data for the shallow dolomite aquifer (Table 3.5) are available at two locations near the installation (Figure 3.6). One location is a residential supply well located approximately 1.5 miles east of the installation. The other location is a test well located approximately 1.5 miles south of the installation.

Water from the shallow dolomite is high in dissolved minerals (Table 3.5). The total dissolved solids content in the water is above recommended limits for public water supplies (USEPA, 1975). The iron content of the water is near the recommended upper limit.

The shallow dolomite well east of the installation (Figure 3.6, Well No. 1) shows signs of contamination. The chloride and sulfate contents in the water appear high and surfactants were detected in the water. Surfactants do not occur naturally in water. The contamination could result from any number of sources.

BIOTIC ENVIRONMENT

O'Hare ARFF has limited habitat available for wildlife. The installation consists mainly of cultivated lawns, building sites, and paved areas which offer negligible shelter for animals. Small tracts of unmowed brush and grass provide forage and cover for small mammals and birds. There are no threatened or endangered plant or animal species inhabiting the installation property. Four endangered animal species are known to inhabit the region (within 50 miles) and may occasionally visit the installation or airport. These are the Indiana bat, peregrine falcon, upland sandpiper, and marsh hawk. There is no indication that past installation activities have disrupted the patterns of these species.

SUMMARY OF ENVIRONMENTAL SETTING

The environmental setting data reviewed for this investigation identified the following major points that are relevant to O'Hare ARFF.

- Net precipitation at the installation is 4.2 inches which indicates that there is some potential for leachate generation at

TABLE 3.5
SUMMARY OF SELECTED WATER QUALITY ANALYSES
FOR WATER FROM THE SHALLOW DOLOMITE AQUIFER
(Analyses in milligrams per liter)

Well No.[2]	Sulfate (250)[1]	Chloride (250)[1]	Total Dissolved Solids (500)[1]	Iron (0.3)[1]	Surfactants
1	160	220	1060	0.3	0.16
2	-	8	750	0.1	-

[1]Recommended drinking water standard (USEPA, 1975).
[2]Refer to Figure 3.6 for well locations.

hazardous waste sites and movement of contaminants in ground water. Rainfall intensity at the installation indicates that there is only a slight potential for erosion and transport of surface contamination from hazardous waste sites. The one-year, 24 hour rainfall event used to gauge erosion and runoff potential was 2.4 inches.

- The permeability of the surficial unconsolidated deposits at the installation is on the order of 10^{-7} cm/sec which does not allow for rapid infiltration of water.
- Four aquifer systems exist at the installation. These aquifer systems are in descending order, the glacial drift aquifer, the shallow dolomite aquifer, the Cambrian-Ordovician aquifer system and the Mt. Simon aquifer.
- The upper glacial drift and shallow dolomite aquifers at the installation are hydraulically connected and are separated from the underlying Cambrian-Ordovician and Mt. Simon aquifers by the relatively impermeable Makoqueta Shale.
- Numerous wells are located in the vicinity of the installation. Industrial and municipal wells near the installation generally withdraw water from the Cambrian-Ordovician aquifer system. The one residential well and one test well identified from the available data withdraw water from the shallow dolomite aquifer. This water is high in dissolved solids and iron.
- Contamination of ground water may potentially occur at subsurface waste disposal sites on the installation. The glacial deposits are at least periodically saturated at depths as shallow as 5 feet below land surface.
- Surface runoff from the installation generally does not meet IEPA stream water quality standards, but is comparable to the water quality upstream in Willow Creek. This poor water quality is typical of highly urbanized areas.
- Portions of the north end of the installation are within the 100-year flood plan.
- No threatened or endangered plant or animal species inhabit the installation property.

SECTION 4

FINDINGS

To assess hazardous waste management at O'Hare Air Reserve Forces Facility (ARFF) at O'Hare International Airport, past activities of waste generation and disposal methods were reviewed. This section summarizes the hazardous waste generated by activity; describes waste disposal methods; identifies the disposal sites located on the base; and evaluates the potential for environmental contamination.

PAST SHOP AND INSTALLATION ACTIVITY REVIEW

A review was conducted of current and past Air Force activities at O'Hare ARFF with the objective of identifying those installation activities that generated hazardous waste. This review consisted of a search of files and records, interviews with installation employees, and site inspection.

The sources of hazardous wastes at O'Hare ARFF can be associated with any one of the activities listed below:

- Industrial Shops
- Fire Protection Training
- Pesticide Utilization
- Waste Storage Areas
- Fuels Management

The following discussion addresses only those wastes generated on the installation which are either hazardous or potentially hazardous. Hazardous wastes are those wastes referenced by the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA, Public Law 96-510). A potentially hazardous waste is one which is suspected of being hazardous although insufficient data are available to fully characterize the waste material.

INDUSTRIAL OPERATIONS (SHOPS)

Since the O'Hare ARFF opened in 1946, the main function of the industrial operations (shops) on the installation has been to provide maintenance support activities to aircraft flying missions. Activities have included aircraft equipment maintenance, ground equipment maintenance, and installation facilities maintenance. A list of present industrial shops was obtained from the installation clinic files. Information contained in the files indicates if the shops handle hazardous materials and generate hazardous waste. A summary of the pertinent information from the shop files is presented in Appendix E, Master List of Industrial Shops.

For the shops known to generate hazardous wastes, interviews with personnel familiar with shop activities were conducted. The information obtained from interviews and installation records has been summarized in Table 4.1. For each generator of hazardous wastes, this table presents the shop location, waste materials generated, quantities of wastes generated, and a disposal method timeline. Many of the disposal methods were identified from information obtained from past and present personnel of O'Hare ARFF. The waste quantities shown in Table 4.1 are based on verbal estimates given by present shop personnel at the time of the interviews. The shops that have generated insignificant quantities or no hazardous waste are not listed in Table 4.1.

From 1943 to 1945 the area that is now O'Hare ARFF was a government-owned, contractor-operated plant (Douglas Aircraft Assembly Plant No. 8). Assembly operations typically do not generate significant amounts of hazardous solid waste. Most of the hazardous waste generated resulted from the painting operations. Several underground tanks stored paint thinners and fuels. All but one of these tanks (a fuel tank) have since been excavated and removed. Paper and other office materials were burned in an incinerator. Other wastes generated by this operation were disposed of in a manner that is not well defined. There are no records of any landfilling or other disposal operations during this period of time.

In the early years of installation operations, (1946 to 1955), an off-site contractor collected combustible liquid wastes (primarily waste oil) and removed them from the installation. From approximately 1955 to

TABLE 4.1

INDUSTRIAL OPERATIONS (Shops)

Waste Management

SHOP NAME	LOCATION (BLDG. NO.)	WASTE MATERIAL	WASTE QUANTITY	METHOD(S) OF TREATMENT, STORAGE & DISPOSAL (1940 – 1950 – 1960 – 1970 – 1980)
AIR FORCE RESERVE, 928th TAG				
AIRCRAFT GROUND EQUIPMENT SHOP	33	PD-680	5 GALS./MO.	CON 1955 FT & CON 1979 CON
		BATTERY ACID	5 GALS./MO.	SAN NEUT, SAN
		WASTE OIL	50 GALS./MO.	CON FT & CON CON
BATTERY/ELECTRICAL SHOP	30	BATTERY ACID	2 GALS./MO.	SAN 1965 NEUT, SAN
		OLD BATTERIES	7 BATTERIES/YEAR	CON
CORROSION CONTROL	30	CLEANING SOLVENTS	10 GALS./MO.	CON & LF 1 1965 LF 2 1970 CON
		OLD SOLVENT CONTAINERS	<20 CANS/MO.	LF 1 LF 2 REF
		PAINT SKIMMINGS	<5 LBS./MO.	LF 1 LF 2 REF
ENGINE SHOP	34	PD-680	110 GALS./MO.	CON FT & CON CON
		WASTE SYNTHETIC OIL	5 GALS./MO.	CON FT & CON CON
		WASTE LUBE OIL	6 GALS./MO.	CON FT & CON CON
		HYDRAULIC FLUID	30 GALS./MO.	CON FT & CON CON
FIRE DEPARTMENT	63	ENGINE OIL	2 GALS./MO.	CON FT & CON CON
		HYDRAULIC FLUID	<1 GAL./YR.	CON FT & CON CON

KEY

———— CONFIRMED TIME-FRAME DATA BY SHOP PERSONNEL

- - - - - - ESTIMATED TIME-FRAME DATA BY SHOP PERSONNEL

LEGEND

NEUT: NEUTRALIZED PRIOR TO DISPOSAL
LF 1: LANDFILL #1
LF 2: LANDFILL #2
CON: OFF-SITE SPECIAL CONTRACTOR
FT: FIRE TRAINING
SAN: SANITARY SEWER
REF: OFF-BASE REFUSE CONTRACTOR

TABLE 4.1 (CONT'D)

INDUSTRIAL OPERATIONS (Shops)

Waste Management

SHOP NAME	LOCATION (BLDG. NO.)	WASTE MATERIAL	WASTE QUANTITY	METHOD(S) OF TREATMENT, STORAGE & DISPOSAL 1940 – 1950 – 1960 – 1970 – 1980
AIR FORCE RESERVE, 928th TAG (cont'd)				
FUEL CELL	35	PD-680	10 GALS./MO.	CON, FT & CON, CON
		JP-4	30 GALS./MO.	CON, FT & CON, CON
FUEL (POL) STORAGE	66	WASTE OIL	8 GALS./MO.	CON, FT & CON, CON
		CONTAMINATED JP-4	24 GALS./MO.	CON, FT & CON, CON
		CONTAMINATED DIESEL FUEL	25 GALS./MO.	CON, FT & CON, CON
MACHINE SHOP	30	WASTE LUBE OIL	<1 GAL./MO.	CON, FT & CON, CON
NON-DESTRUCTIVE INSPECTION SHOP	59	PHOTO CHEMICALS	<15 GALS./MO.	SAN
PNEUDRAULICS SHOP	30	HYDRAULIC FLUID	1 GAL./MO.	CON, FT & CON, CON
		PD-680	4 GALS./MO.	CON, FT & CON, CON
PROPULSION SHOP	34	PD-680	7 GALS./MO.	CON, FT & CON, CON
		HYDRAULIC FLUID	20 GALS./MO.	CON, FT & CON, CON
ROADS AND GROUNDS SHOP	55	EMPTY HERBICIDE CONTAINER	<3/MO.	LF 1, LF 2, REF
		ENGINE OIL	4 GALS./MO	CON, FT & CON, CON
		HYDRAULIC FLUID	2 GALS./MO.	CON, FT & CON, CON
		KEROSENE	4 GALS./MO.	CON, FT & CON, CON

KEY

——— CONFIRMED TIME-FRAME DATA BY SHOP PERSONNEL

- - - - - ESTIMATED TIME-FRAME DATA BY SHOP PERSONNEL

LEGEND

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TABLE 4.1 (CONT'D)

INDUSTRIAL OPERATIONS (Shops)

Waste Management

SHOP NAME	LOCATION (BLDG. NO.)	WASTE MATERIAL	WASTE QUANTITY	METHOD(S) OF TREATMENT, STORAGE & DISPOSAL (1940 – 1950 – 1960 – 1970 – 1980)
AIR FORCE RESERVE, 928th TAG (cont'd)				
VEHICLE MAINTENANCE FACILITY	50	BATTERY ACID	10 GALS./MO.	SAN 1965 NEUT, SAN
		OLD BATTERIES	1 BATTERY/MO.	CON
		HYDRAULIC FLUID	5 GALS./MO.	CON FT & CON CON
		ENGINE WASTE OIL	80 GALS./MO.	CON FT & CON CON
		PD-680	10 GALS./MO.	CON FT & CON CON
		ANTIFREEZE	20 GALS./MO.	SAN CON
ILLINOIS AIR NATIONAL GUARD				
AIRCRAFT GROUND EQUIPMENT SHOP	24	PD-680	10 GALS./MO.	CON FT & CON CON
		WASTE OIL	30 GALS./MO.	CON FT & CON CON
VEHICLE MAINTENANCE SHOP	5	WASTE OIL	20 GALS./MO.	CON FT & CON CON
		PD-680	10 GALS./MO.	CON FT & CON CON
ENGINE SHOP	70	PD-680	15 GALS./MO.	CON 1955 FT & CON 1979 CON
		WASTE OIL	35 GALS./MO.	CON FT & CON CON
REPAIR AND RECLAMATION SHOP	30	PD-680	10 GALS./MO.	CON 1955 FT & CON 1979 CON
		JP-4	<10 GAL./MO.	CON FT & CON CON
		PAINT REMOVER	<2 GALS./MO.	CON & LF 1 1965 LF 2 1970 CON

KEY

——— CONFIRMED TIME-FRAME DATA BY SHOP PERSONNEL

- - - - - ESTIMATED TIME-FRAME DATA BY SHOP PERSONNEL

LEGEND

NEUT: NEUTRALIZED PRIOR TO DISPOSAL

LF 1: LANDFILL #1

LF 2: LANDFILL #2

CON: OFF-SITE SPECIAL CONTRACTOR

FT: FIRE TRAINING

SAN: SANITARY SEWER

REF: OFF-BASE REFUSE CONTRACTOR

TABLE 4.1 (CONT'D)

INDUSTRIAL OPERATIONS (Shops)

Waste Management

SHOP NAME	LOCATION (BLDG. NO.)	WASTE MATERIAL	WASTE QUANTITY	METHOD(S) OF TREATMENT, STORAGE & DISPOSAL 1940 1950 1960 1970 1980
ILLINOIS AIR NATIONAL GUARD (cont'd)				
VEHICLE MAINTENANCE FACILITY	12	BATTERY ACID	5 GALS./MO.	SAN NEUT, SAN
		OLD BATTERIES	<1 BATTERY/MO.	CON
		HYDRAULIC FLUID	5 GALS./MO.	CON FT & CON CON
		WASTE OIL	50 GALS./MO.	CON FT & CON CON

KEY

———— CONFIRMED TIME-FRAME DATA BY SHOP PERSONNEL

------ ESTIMATED TIME-FRAME DATA BY SHOP PERSONNEL

LEGEND

NEUT: NEUTRALIZED PRIOR TO DISPOSAL
LF 1: LANDFILL #1
LF2: LANDFILL # 2
CON: OFFSITE SPECIAL CONTRACTOR
FT: FIRE TRAINING
SAN: SANITARY SEWER
REF: OFF-BASE REFUSE CONTRACTOR

1979, combustible wastes were burned at the Fire Protection Training Areas (see following discussion). Presently these wastes are drummed and stored for outside contract disposal.

Cleaning solvents and related wastes were sometimes removed by the off-site contractor in the early years. At other times, the solvent-type wastes were drummed and disposed of in one of the two installation landfills.

Solids waste generated by shop operations, along with the rest of the installation's general rubbish, was disposed of in the installation landfills through 1970, when landfilling operations ceased. Since then it has been removed from the installation by a contract-disposal company.

Fire Protection Training

Since 1955, fire protection training exercises have been conducted by the Air Force at three locations. Only one of these was located on what is now installation property (Figure 4.1). Prior to 1955, it is uncertain what, if any, fire protection training was done.

Fire Protection Training Area

From approximately 1955 to the early 1960's, the Air Force fire department conducted fire training exercises in an area on the southeast side of the installation. The burn pit was constructed with an earth berm and a natural soil bottom. AVGAS, MOGAS, waste oil and combustible liquids were burned here. It is unknown whether there was any water presoaking, or how frequently training was practiced or what extinguishing agents were used. No visual evidence of the site was present during the site visit since the area is now covered by a hardfill area.

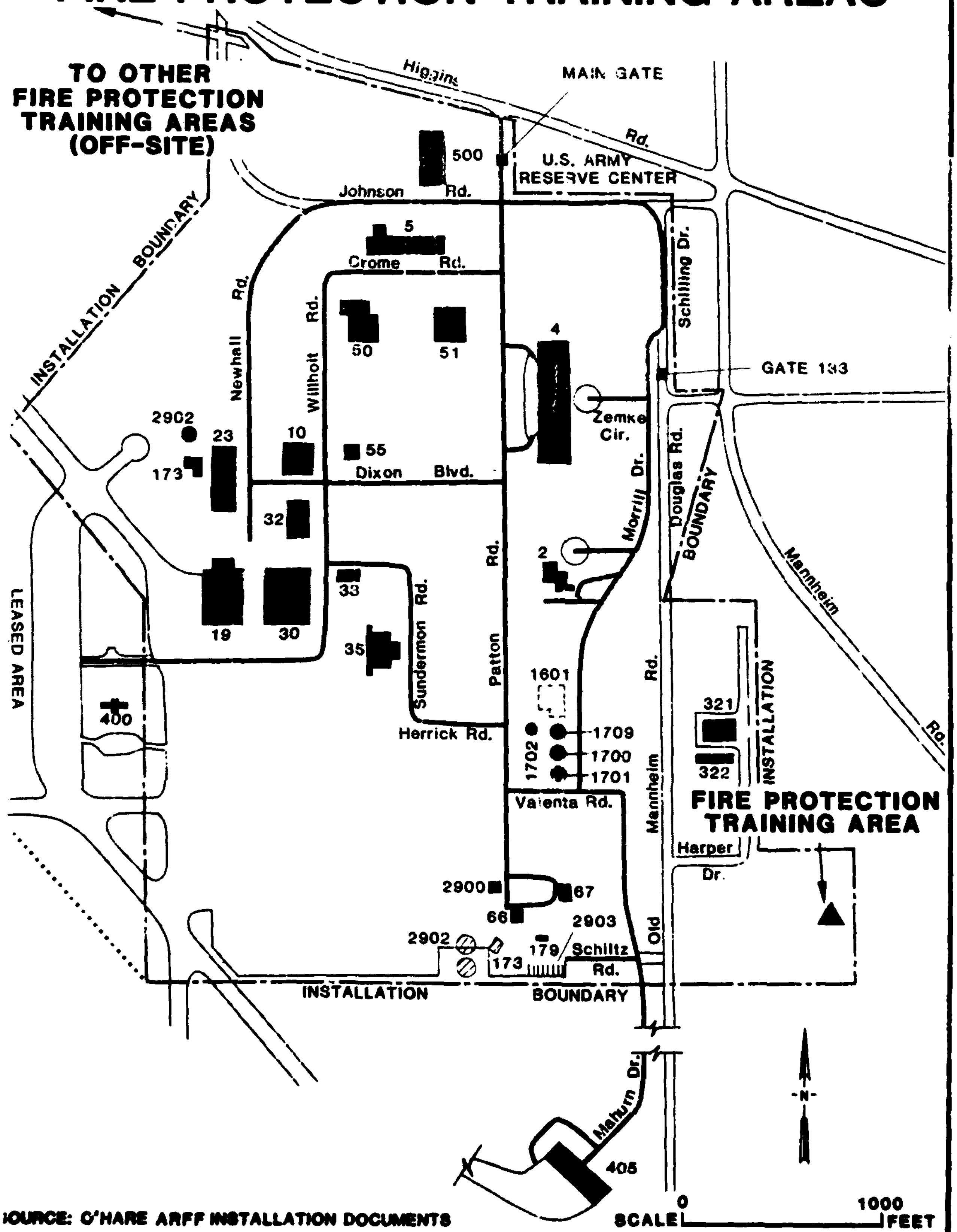
Other Fire Protection Training Areas

From the early 1960's through the present day, fire training exercises have taken place at two sites on O'Hare International Airport property under a joint training agreement. One Fire Protection Training Facility was located just north of Old Higgins Road. The current Fire Protection Training Facility is located approximately one mile south of the second site.

Pesticide Utilization

Pesticide applications have been conducted by the Roads and Grounds Shop and O'Hare ARFF throughout the history of the installation. Currently, shop personnel apply 2-Prometon (an amine herbicide) annually

O'HARE ARFF
FIRE PROTECTION TRAINING AREAS



SOURCE: O'HARE ARFF INSTALLATION DOCUMENTS

throughout the installation for general weed control. All of the pesticide material prepared is used up in the application process. No other pesticides or herbicides were reported as being used. Containers are rinsed and disposed of as general refuse.

Waste Storage Areas

Presently, waste chemicals and used oils at O'Hare ARFF are accumulated at the site of generation until removed to a central storage area. This storage area is located in a depressed area at the south end of the Old Assembly Plant foundation, a former truck loading area (Figure 4.2). The area is open to the weather and access is not controlled. The soil in this storage area was darker than normal, indicating that past spills had occurred.

Drums of waste from the hangers are accumulated on an outside concrete wash rack area adjacent to the buildings (Figure 4.2). The area is located over a drain grill that discharges to either the surface drainage system or the sanitary sewer system. During aircraft washing operations, the drain is directed to the sanitary sewer via a nearby, underground oil/water separator. Otherwise, the drain feeds the storm sewer system. The discharge direction is selected by moving a vane located underneath the grill. The concrete is stained indicating that spills and/or leaks have occurred.

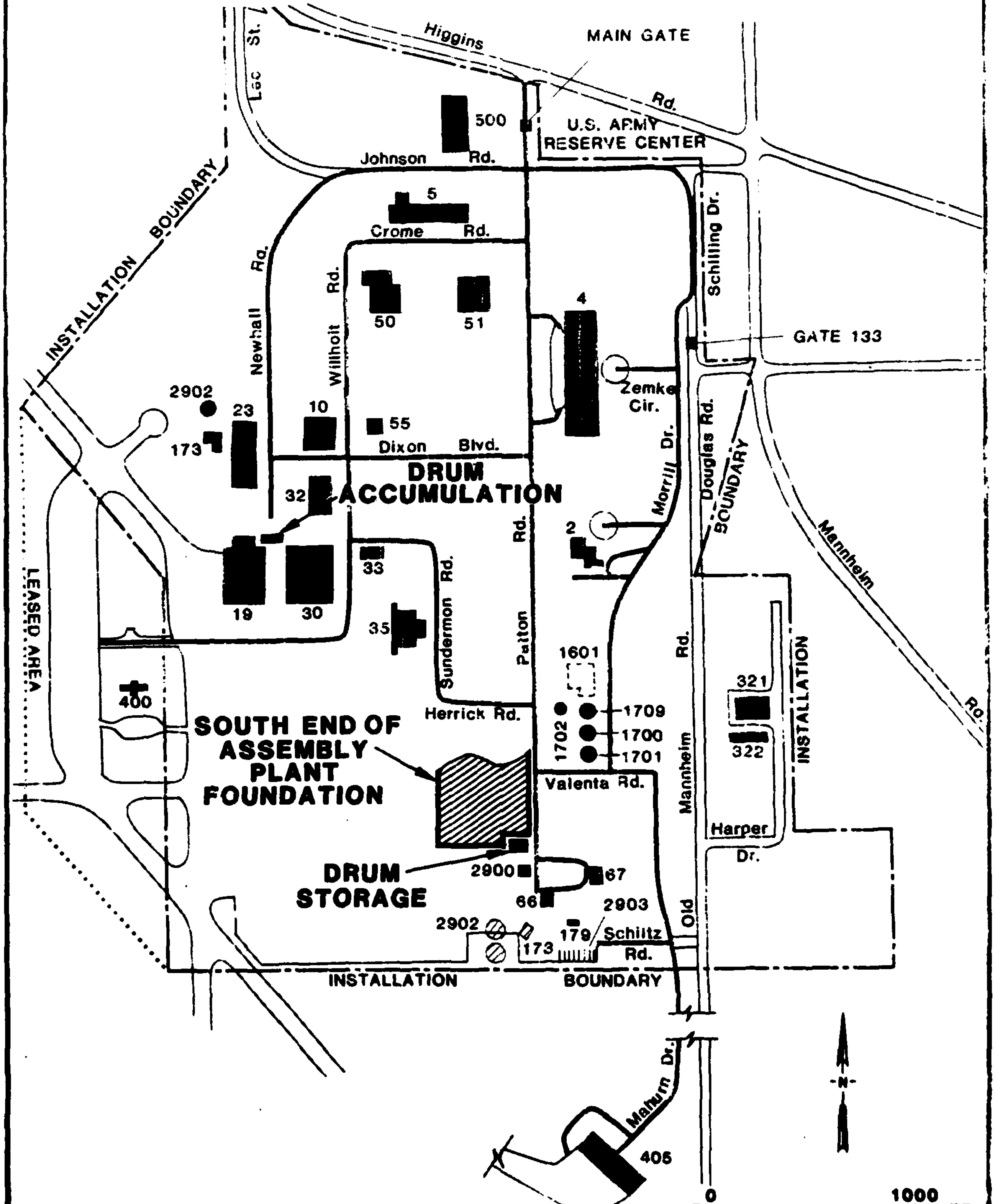
Fuels Management

The O'Hare ARFF Fuels Management storage system consists of fifteen above ground and below ground tanks in two areas (west POL and south POL areas). A listing of the locations of the fuel storage tanks and their contents and capacities has been provided in Appendix D. Fuels stored at O'Hare ARFF include: JP-4, MOGAS, FS-5 and FS-2 (No. 2 Fuel Oil). Fuels are currently delivered to the installation by tank truck. In the past, fuel has been delivered to the west and south POL areas by railcar as well.

JP-4 is stored in the west POL storage area in one above ground 210,000 gallon tank and two under ground 50,000 gallon tanks. The aboveground tank is equipped with secondary containment in the form of an earth dike over an asphaltic material. The diked areas are checked daily, with water accumulations discharged to the surface drainage system. A hydrant network was previously used to fuel aircraft on the

FIGURE 4.2

O'HARE ARFF
HAZARDOUS WASTE DRUM ACCUMULATION AND STORAGE SITES



SOURCE: O'HARE ARFF INSTALLATION DOCUMENTS

west aircraft apron. This network was shut down in the early 1970's for replacement. Currently fuel leaves the area through the new hydrant system and in tank trucks. The South POL area has nine 25,000 gallon and two 11,500 gallon above ground JP-4 tanks. It also has has one 25,000 gallon above ground tank which has been partitioned in two, with one half holding 12,500 gallons of FS-2 and the other half nearly empty. At one time, this other half held engine oil. Fuel is removed from this area for use by tank truck only.

Spills and Leaks

Small fuel spills have occurred in several areas throughout the installation. The spills are generally attributed to fuel transfer and aircraft refueling operations. They typically occur on paved areas and evaporate or are cleaned up. No significant environmental contamination is attributed to these spills.

A major spill occurred in January 1972 at the aboveground JP-4 tank in the West POL area (Figure 4.3). The dike accumulated water from exceptionally heavy rains. A rapid change of weather then froze the water causing it to crush the external piping to the tank. This resulted in 82,000 gallons of fuel being released within the dike. About 40,000 gallons of fuel were recovered and the remaining fuel either infiltrated into the ground or evaporated.

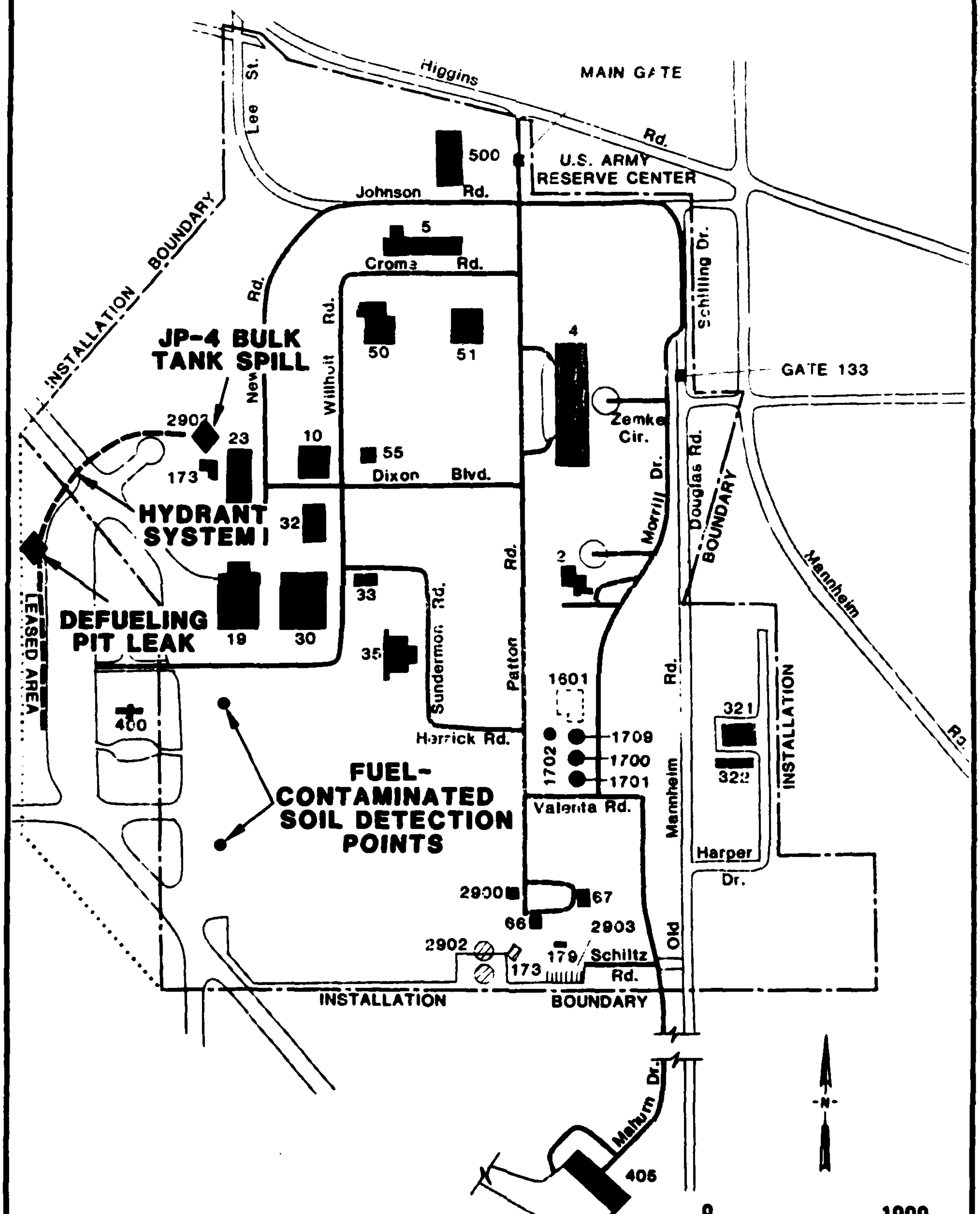
Another spill occurred when a 12,000 gallon defueling pit along the old hydrant network (Figure 4.3) cracked due to external pressure exerted on it during a winter freeze in the late 1960's. The leak was discovered later when water began to appear in the fuel passing through this tank. The amount of JP-4 lost is not known. The tank has been removed and replaced.

During an Airfield Pavement Evaluation in 1977, fuel-contaminated soil was discovered beneath the main apron at two points (Figure 4.3). The soil was described as "saturated with jet fuel." No source for this contamination was immediately identifiable, although the underground hydrant system has had leaks before, and a preliminary evaluation suggests that it is upgradient of the contamination.

There is an abandoned underground MOGAS tank located on the south edge of the installation. This tank dates from the 1940's and was used at least through the early 1960's. No records could be found to

FIGURE 4.3

O'HARE ARFF
POL SPILLS AND LEAKS



SOURCE: O'HARE ARFF INSTALLATION DOCUMENTS

SCALE 0 1000 FEET

dèscribe the tank, and no information regarding tank closure could be established.

A ground disposal site at the Vehicle Maintenance Facility (Bldg. 5) (Figure 4.4) was reported to be the location for regular dumping of motor oil until the mid 1970's. No evidence of this action was observed during the site visit since the area behind the building has been covered over by a concrete vehicle parking lot. The contaminated soil may have been removed during construction of the parking lot.

During the 1950's and 1960's the area south of the south apron was used as an occasional dumping area for small quantities of liquid wastes from the shops (Figure 4.4). The material would flow into a storm water drainage ditch which ran parallel to the edge about ten feet away and be washed away from the site. Due to the irregular frequency and small quantity of dumpings, this area was not listed as a "disposal method" in Table 4.1, Industrial Operations. No evidence of environmental stress could be found here during the site visit.

DESCRIPTION OF PAST ON-INSTALLATION DISPOSAL METHODS

The facilities at O'Hare ARFF which have been used for the management and disposal of waste can be categorized as follows:

- Landfills
- Hardfills
- Storm Drainage System
- Sanitary Sewer System
- Low Level Radioactive Disposal Area

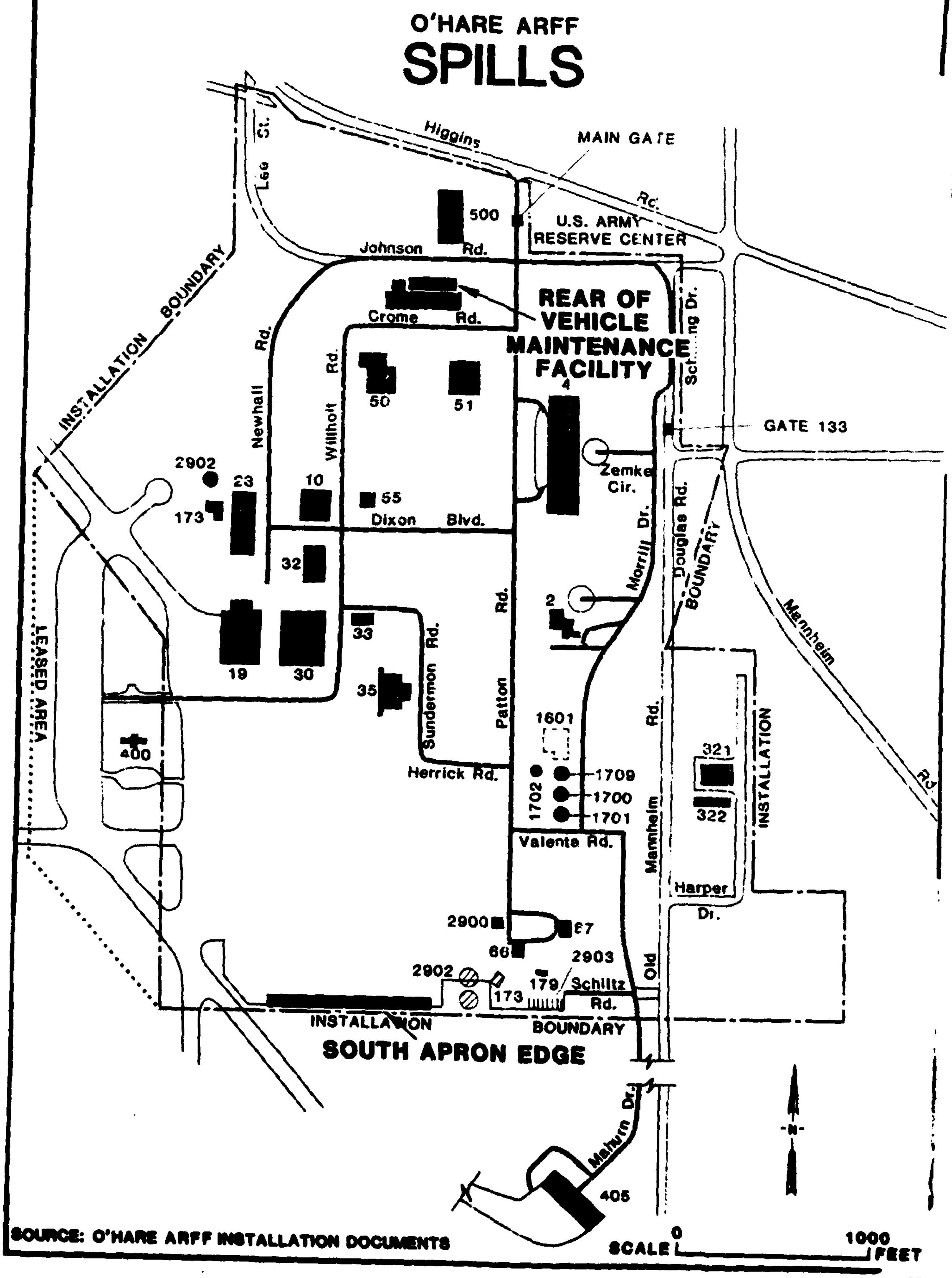
Landfills

Two landfill operations were identified at O'Hare ARFF. These two landfills are discussed below.

Landfill No. 1 (1953-1965)

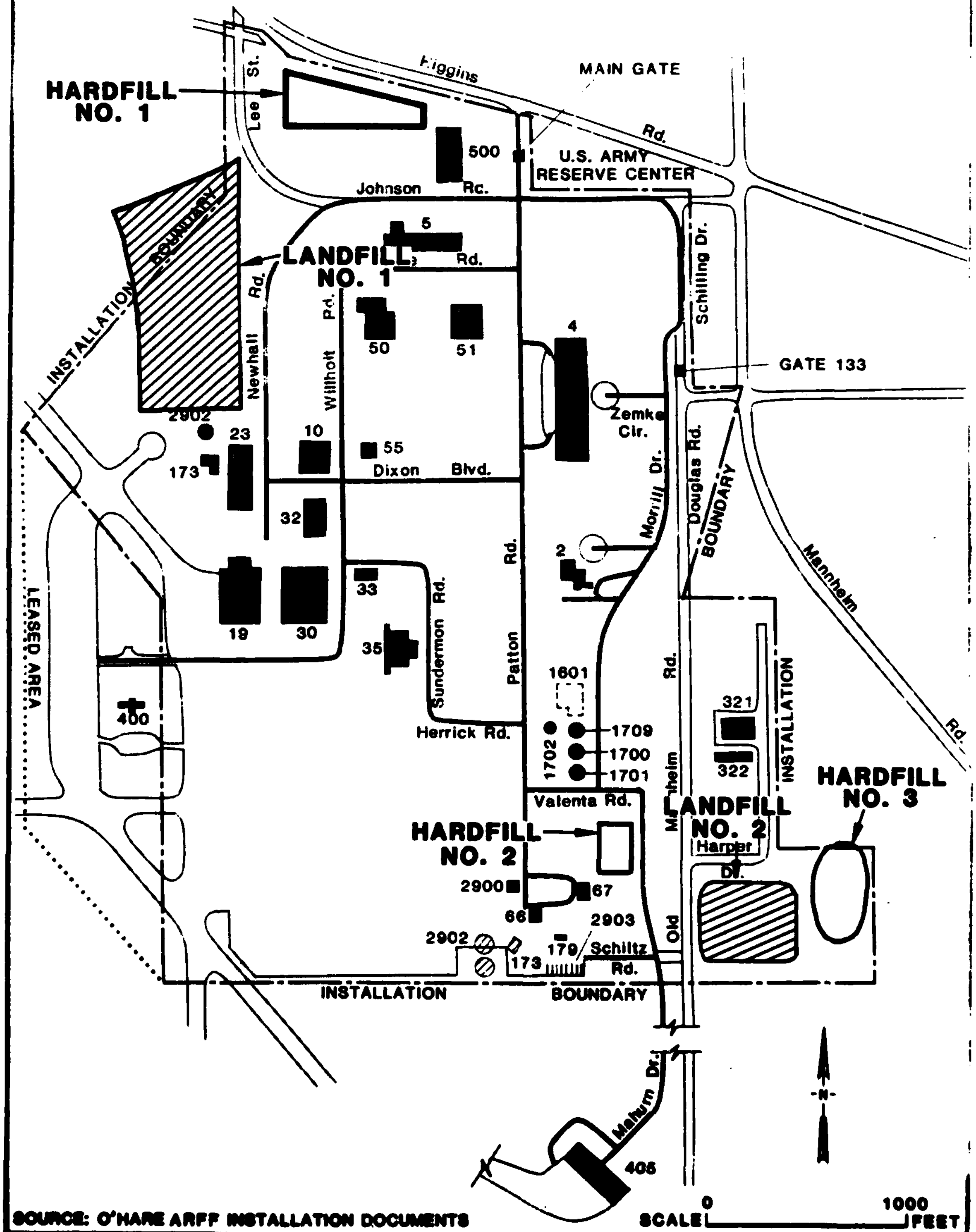
Landfill No. 1 was operated from 1953-1965. It was located on the northwest side of the installation, along Newhall/Lee Street and Higgins (Figure 4.5). During the early operation, trash was filled in a slightly depressed area. Trench and fill operations became the standard operating procedure after a few years. The trenches were excavated

FIGURE 4.4


O'HARE ARFF
SPILLS
Higgins Rd.
MAIN GATE
Lee St.
500
U.S. ARMY RESERVE CENTER
Johnson Rd.
REAR OF VEHICLE MAINTENANCE FACILITY
Crome Rd.
INSTALLATION BOUNDARY
Newhall Rd.
Willhoit Rd.
50
51
4
GATE 133
Zemke Cir.
2902
23
10
55
173
Dixon Blvd.
32
Morrill Dr.
Douglas Rd.
BOUNDARY
Mannheim Rd.
2
33
Patton Rd.
Sundermon Rd.
19
30
35
LEASED AREA
1601
400
321
Herrick Rd.
1709
1702
1700
1701
322
INSTALLATION
Valenta Rd.
Mannheim Rd.
Harper Dr.
2900
67
66
2903
2902
179
173
Schiltz Rd.
Old
INSTALLATION BOUNDARY
SOUTH APRON EDGE
Mahurn Dr.
405
N
SOURCE: O'HARE ARFF INSTALLATION DOCUMENTS
SCALE 0 1000 FEET

O'HARE ARFF

LANDFILLS AND HARDFILLS



SOURCE: O'HARE ARFF INSTALLATION DOCUMENTS

about 10 feet deep. The landfill received at least some portion of all wastes generated on the installation, including general refuse and office trash, old aircraft part, old kitchen-type appliances and both new and old tools. It was also reported that some drummed waste from the shop operations went into this landfill. There was occasional burning at this landfill. The operation ceased in 1965 when the airport runways were expanded. The site is closed and has an earth cover. Holes dug by burrowing animals indicate that the landfill is close to the present surface of the ground in the area.

Landfill No. 2 (1965-1972)

When Landfill No. 1 was closed, the landfill operation was moved to southeast portion of the installation (Figure 4.5). Landfill No. 2 was operated from 1965 through 1972. This landfill was operated in two adjacent areas and was almost exclusively a trench and fill operation. Part of Landfill No. 2 is located outside the O'Hare ARFF. The trenches were about 10 feet deep. It continued to receive the same type of wastes as disposed of at Landfill No. 1. Drums of shop wastes were crushed and buried with earth-moving equipment. There was no burning of waste at this site. The landfill is closed and has an earth cover.

Hardfills

Three hardfill sites were identified on O'Hare ARFF (Figure 4.5). Hardfill No. 1 was operated during the early period of installation operations. It received only construction materials. Hardfill No. 2 was operated during 1965 and received miscellaneous non-hazardous rubble from the demolition at the old Assembly Plant Building. The site is closed and is covered with soil. Hardfill No. 3, located by Landfill No. 2 has received concrete rubble since 1965 and is still open. Hardfill No. 3 is located over the old Fire Protection Training Area.

Storm Drainage System

The installation storm drainage system collects water runoff from the civilian airport and the Air Force installation at O'Hare and conveys it through both wooden and concrete pipes to an open drainage ditch off of the installation property. This ditch in turn discharges to Willow Creek. Although no shop wastes or other hazardous materials were regularly disposed of to this system, intermittant spills have occasionally entered the pipes. A number of the wooden pipe sections have

collapsed, indicating that any materials which have entered the system have probably been in direct contact with the ground around it.

Sanitary Sewer System

There is no treatment of sanitary wastewater on the base. Since the beginning of the operation of the Douglas Aircraft Assembly Plant through to the present day the network of sanitary sewer piping has been connected to the City of Chicago Sanitary District System. Typically shop wastes and other hazardous materials do not enter the sanitary sewer, with the exception of neutralized battery acid and photochemicals.

Low-level Radiation Disposal Site

The low-level radiation disposal sites is located northeast of the south POL tank farm (Figure 4.6). The site was used for disposal of low-level radioactive vacuum tubes. The site was operated during the 1950's and 1960's and closed in the late 1960's. The waste material was placed in a pit about eight feet deep and then covered with earth. There is no marking or fence at this site.

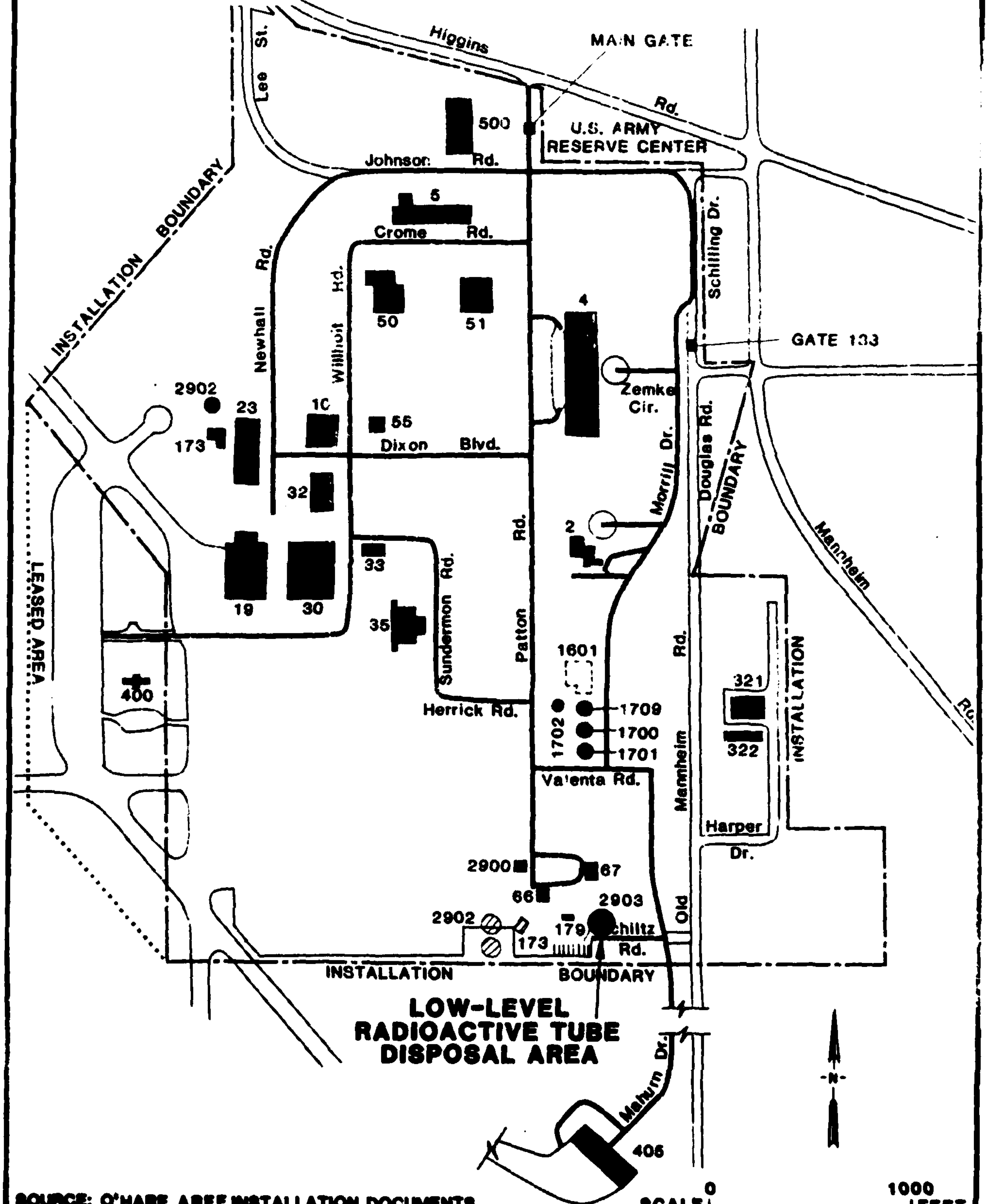
EVALUATION OF PAST DISPOSAL ACTIVITIES AND FACILITIES

The review of past operation and maintenance functions and past waste management practices at O'Hare ARFF has resulted in the identification of 16 sites which were initially considered as areas of concern with regard to the potential for contamination, as well as the potential for the migration of contaminants. These sites were evaluated using the Decision Tree Methodology shown in Figure 1.1. Those sites which were considered as not having a potential for contamination were deleted from further consideration. Those sites which were considered as having a potential for the occurrence of contamination and migration of contaminants were further evaluated using the Hazard Assessment Rating Methodology (HARM) (Appendix H). Table 4.2 identifies the decision tree logic used for each of the areas of intitial concern.

Based on the decision tree logic, five of the 16 sites originally reviewed did not warrant evaluation using the Hazard Assessment Rating Methodology. The rationale for omitting these five sites from HARM evaluation is discussed below.

FIGURE 4.6

O'HARE ARFF
LOW-LEVEL RADIOACTIVE TUBE DISPOSAL AREA



SOURCE: O'HARE ARFF INSTALLATION DOCUMENTS

TABLE 4.2
SUMMARY OF DECISION TREE LOGIC FOR AREAS OF INITIAL ENVIRONMENTAL CONCERN AT O'HARE ARFF

Site Description	Potential for Contamination	Potential For Contaminant Migration	Other Environmental Concern	HARM Rating
Landfill No. 1	YES	YES	N/A	YES
Landfill No. 2	YES	YES	N/A	YES
JP-4 Tank Spill Site	YES	YES	N/A	YES
Defueling Pit Leak Site	YES	YES	N/A	YES
Fire Protection Training Area	YES	YES	N/A	YES
Storm Drainage System in the Hangar Area	YES	YES	N/A	YES
Hazardous Waste Drum Accumulation Point	YES	NO	YES	NO
Hazardous Waste Storage Area	YES	YES	N/A	YES
South Edge of Apron	YES	YES	N/A	YES
Vehicle Maintenance Facility	YES	YES	N/A	YES
Low Level Radioactive Disposal Site	YES	YES	N/A	YES
Hardfill No.1	NO	NO	NO	NO
Hardfill No. 2	NO	NO	NO	NO
Hardfill No. 3	NO	NO	NO	NO
Buried Tanks from the Douglas Operation (1942-1945)	NO	NO	YES	NO
Fuel-Contaminated Soil Under Main Apron	YES	YES	N/A	YES

Hardfill No. 1 was used for the disposal of construction rubble only. This material is nonhazardous and would not cause any environmental contamination.

Hardfill No. 2 was used for the disposal of building debris during the demolition of the old Assembly Plant Building and received only wood, concrete, glass and some plumbing piping. This material is nonhazardous and hence would not cause any environmental contamination.

Hardfill No. 3 is used for the disposal of concrete and stone rubble and as such, would not cause any environmental contamination.

Several underground tanks stored paint thinners and fuels for the Douglas Aircraft Co. during the 1940's. All but one of these tanks have since been excavated and removed. No reports were found of any leaks or spills from these tanks and hence, the site poses no potential for contamination of the environment.

The Hazardous Waste Drum Accumulation Point is located over a large concrete pad. In the event of a spill, the wastes would not run off onto the earth. Instead they would either stay where they were spilled or they would enter the installation's storm sewer system. (The storm sewer system is rated using the HARM method.) Hence, no potential for environmental contamination exists at this site itself.

The remaining 11 sites identified on Table 4.2 were evaluated using the Hazard Assessment Rating Methodology. The HARM process takes into account characteristics of potential receptors, waste characteristics, pathways for migration, and specific characeristics of the site related to waste management practices. The details of the rating results are summarized in Table 4.3. The HARM system is designed to be one of the many indicators of the relative need for follow-on action. The information presented in Table 4.3 is intended for assigning priorities for further evaluation of the O'Hare ARFF disposal areas (Section 5, Conclusions and Section 6, Recommendations). The rating forms for the individual waste disposal sites at O'Hare ARFF are presented in Appendix H. Photographs of some of the disposal sites are included in Appendix F.

TABLE 4.3
SUMMARY OF HARM SCORES FOR POTENTIAL CONTAMINATION SOURCES
O'HARE ARFF

Rank	Site Name	Receptor Subscore	Waste Characteristics Subscore	Pathways Subscore	Waste Management Factor	Overall Total Score
1	Landfill No. 1	57	90	67	0.95	68
2	JP-4 Tank, West POL Area	57	80	67	0.95	65
3	Fuel-Contaminated Soil	57	54	80	1.00	64
4	Defueling Pit Leak Site	57	64	67	1.00	63
5	Fire Protection Training Area	57	64	67	0.95	60
6	Hazardous Waste Storage Area	57	60	67	0.95	58
7	Landfill No. 2	57	50	67	0.95	55
8	Storm Drainage System	57	36	67	1.00	53
9	South Edge of Apron	57	32	67	1.00	52
10	Vehicle Maintenance Facility	57	24	67	1.00	49
11	Low Level Radioactive Disposal Site	57	15	67	0.95	44

SECTION 5

CONCLUSIONS

The goal of the IRP Phase I Study is to identify sites where there is the potential for environmental contamination resulting from past waste disposal practices and to assess the probability of contaminant migration from these sites. The conclusions given below are based on the assessment of the information collected from the project team's field inspection, review of records and files, review of the environmental setting, and interviews with installation personnel, past employees, and state and local government employees. Table 5.1 contains a list of the potential contamination sources identified at O'Hare ARFF and a summary of the HARM scores for those sites. The sites themselves are discussed below.

LANDFILL NO. 1

Landfill No. 1 has a sufficient potential to create environmental contamination and follow-on investigation is warranted. The landfill was operated between 1953 and the mid 1960's and received various wastes generated on the installation, including general refuse and office trash, old aircraft parts, and drums containing shop wastes. The shop wastes were probably spent solvents, waste oils and sludges. There was occasional burning at this landfill and the waste is buried to a depth of about 10 feet. The water table is high and ground-water is very likely in contact with the wastes. The site received a HARM score of 68.

JP-4 SPILL SITE

The JP-4 Tank spill site has a sufficient potential to create environmental contamination and follow-on investigation is warranted. In 1972, an 82,000 gallon spill of JP-4 occurred at the west POL area. The spill was contained inside the dike area and 40,000 gallons of JP-4 was

TABLE 5.1

PRIORITY RANKING OF POTENTIAL CONTAMINATION SOURCES

Rank	Site Name	Dates of Operation Or Occurrence	Overall HARM Score
1	Landfill No. 1	1953-1960's	68
2	JP-4 Tank, West POL Area	January 1972	65
3	Fuel-Contaminated Soil	1977	64
4	Defueling Pit Leak Site	Late 1960's	63
5	Fire Protection Training Facility	1955-early 1960's	60
6	Hazardous Waste Storage Area	1981-Present	58
7	Landfill No. 2	1965-early 1970's	55
8	Storm Drainage System	1942-Present	53
9	South Edge of Concrete Apron	Prior to 1970	52
10	Vehicle Maintenance Facility, Rear	Prior to 1977	49
11	Low Level Radioactive Disposal Site	Prior to 1970	44

recovered. The remaining estimated 42,000 gallons of JP-4 either evaporated or infiltrated into the ground. The water table is high in this area and the fuel likely contacted the water table in the upper glacial drift. The site received a HARM score of 65.

FUEL-CONTAMINATED SOIL

The fuel-contaminated soil under the main apron indicates that there is a sufficient potential created for environmental contamination and follow-on investigation is warranted. When discovered in 1977, the soil was described as "saturated with jet fuel." The site received a HARM score of 64.

DEFUELING PIT LEAK

The defueling pit leak site has a sufficient potential to create environmental contamination and follow-on investigation is warranted. This 12,000 gallon underground tank developed a leak which was present for an undetermined period of time prior to its discovery in the late 1960's, when water appeared in the fuel passing through this tank. The amount of JP-4 lost is not known. The site received a HARM score of 63.

FIRE PROTECTION TRAINING AREA

Fire Protection Training Area has a sufficient potential to create environmental contamination and follow-on investigation is warranted. From approximately 1955 to the early 1960's, the installation fire department conducted fire training exercises in an area on the southeast side of the installation. The burn pit was constructed with a soil bottom and an earth berm around it. Contaminated fuels (AVGAS, MOGAS) and combustible liquid wastes were burned during fire protection training exercises. The site is now covered by a hardfill. This site received a HARM score of 60.

HAZARDOUS WASTE STORAGE AREA

The Hazardous Waste Storage Area has a sufficient potential to create environmental contamination and follow-on investigation is warranted. This storage area is located in a depressed area at the south end of the Old Assembly Plant foundation (a former truck loading

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O'HARE ARFF

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SECTION 5

CONCLUSIONS

The goal of the IRP Phase I Study is to identify sites where there is the potential for environmental contamination resulting from past waste disposal practices and to assess the probability of contaminant migration from these sites. The conclusions given below are based on the assessment of the information collected from the project team's field inspection, review of records and files, review of the environmental setting, and interviews with installation personnel, past employees, and state and local government employees. Table 5.1 contains a list of the potential contamination sources identified at O'Hare ARFF and a summary of the HARM scores for those sites. The sites themselves are discussed below.

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recovered. The remaining estimated 42,000 gallons of JP-4 either evaporated or infiltrated into the ground. The water table is high in this area and the fuel likely contacted the water table in the upper glacial drift. The site received a HARM score of 65.

FUEL-CONTAMINATED SOIL

The fuel-contaminated soil under the main apron indicates that there is a sufficient potential created for environmental contamination and follow-on investigation is warranted. When discovered in 1977, the soil was described as "saturated with jet fuel." The site received a HARM score of 64.

DEFUELING PIT LEAK

The defueling pit leak site has a sufficient potential to create environmental contamination and follow-on investigation is warranted. This 12,000 gallon underground tank developed a leak which was present for an undetermined period of time prior to its discovery in the late 1960's, when water appeared in the fuel passing through this tank. The amount of JP-4 lost is not known. The site received a HARM score of 63.

FIRE PROTECTION TRAINING AREA

Fire Protection Training Area has a sufficient potential to create environmental contamination and follow-on investigation is warranted. From approximately 1955 to the early 1960's, the installation fire department conducted fire training exercises in an area on the southeast side of the installation. The burn pit was constructed with a soil bottom and an earth berm around it. Contaminated fuels (AVGAS, MOGAS) and combustible liquid wastes were burned during fire protection training exercises. The site is now covered by a hardfill. This site received a HARM score of 60.

HAZARDOUS WASTE STORAGE AREA

The Hazardous Waste Storage Area has a sufficient potential to create environmental contamination and follow-on investigation is warranted. This storage area is located in a depressed area at the south end of the Old Assembly Plant foundation (a former truck loading

area). The soil in this storage area was darker than normal, indicating that past spills have occurred. This site received a HARM score of 58.

LANDFILL NO. 2

Landfill No. 2 has a sufficent potential to create environmental contamination and follow-on investigation is warranted. This landfill was in operation from the mid 1960's through 1972 and was operated in two adjacent areas in a trench and fill manner. A portion of this landfill is located outside of O'Hare ARFF property. Trenches were about 10 feet deep. It received general refuse, office trash and some shop wastes. Some drums of shop wastes were crushed with earth moving equipment. There was no burning of waste at this site. The landfill is closed and covered. The water table is high and ground water is very likely in contact with the wastes. The site received a HARM score of 55.

STORM DRAINAGE SYSTEM NEAR HANGARS

The Storm Drainage System in the Aircraft hangar area has a sufficient potential to create environmental contamination and follow-on investigation is warranted. The system in this area has probably received shop wastes from the hangars. Also, liquid hazardous wastes are accumulated in an area which drains directly into this wood- and concrete-pipe system. The system received a HARM score of 53.

SOUTH EDGE OF APRON

The south edge of the main concrete apron has a sufficient potential to create environmental contamination and follow-on investigation is warranted. This area was occasionally used as a dumping area for small quantities of liquid wastes from the shops in the 1950's and 1960's. A stormwater drainage ditch runs parallel to the edge, about ten feet away. During the site visit, no environmental stress was observed in this area. The site received a HARM score of 52.

VEHICLE MAINTENANCE FACILITY

The rear of the vehicle maintenance facility has an insufficient potential to create environmental contamination and no follow-on

investigation is warranted. Motor oil was dumped on the ground north of Building No. 5 from the early 1950's until about 1975. The area behind the building has been covered over by a concrete vehicle parking lot. The contaminated soil may have been removed when the parking lot was built. The site received a HARM score of 49.

LOW-LEVEL RADIOACTIVE DISPOSAL SITE

The low-level radioactive disposal site has an insufficient potential to create environmental contamination and no follow-on investigation is warranted. This area was used for the disposal of vacuum tubes during the 1950's and the 1960's. The site received a HARM score of 44.

SECTION 6

RECOMMENDATIONS

Eleven sites were identified at O'Hare ARFF as having the potential for environmental contamination and have been evaluated using the HARM system. This evaluation assessed their relative potential for environmental contamination and along with relevant site specific information identified those sites where further study and monitoring may be necessary. Nine of the sites were determined to have sufficient evidence to indicate the potential for environmental contamination. Additional data concerning these sites will be required in order to clearly ascertain whether or not these sites have contributed environmental contamination. Therefore, the following recommendations have been developed for each of the nine sites. There was insufficient evidence on the other two sites to warrant further investigation.

PHASE II MONITORING RECOMMENDATIONS

The following recommendations are made to further assess the potential for environmental contamination from waste disposal areas at O'Hare ARFF. The recommended actions are generally one-time sampling programs to determine if contamination does exist at the site. If contamination is identified, the sampling program may need to be expanded to further define the extent of contamination.

Geophysical surveys, consisting of electrical resistivity, electromagnetic and/or magnetometer techniques, are recommended prior to any well installations to attempt to delineate the horizontal and vertical extent of the site, subsurface leachate plumes migrating from the site, and subsurface stratigraphy including the hardpan formation. The alternative approach to geophysical testing would be the conventional technique to test well drilling and ground-water sampling. The cost benefit

of geophysical surveys over test drilling can be understood by comparisons of time, cost and data availability. Table 6.1 presents general guidelines for the use of certain geophysical techniques.

The recommended monitoring program for Phase II is summarized in Table 6.2.

1) Landfill No. 1 has a sufficient potential to create environmental contamination and monitoring of this site is recommended. A geophysical survey should be conducted to define the landfill boundaries and depth, and identify any leachate plume. Based on the results of the geophysical survey, one upgradient and 3 downgradient monitoring wells should be installed. Wells should be constructed using 3" Schedule 40 PVC, screened into the first sand and gravel lens (20' to 30' deep). Sample these wells and analyze for pH, total dissolved solids, total organic halogen, total organic carbon, oil and grease, and phenol.

2) The JP-4 Tank Dike Spill Site has a sufficient potential to create environmental contamination and further monitoring of this site is recommended. A geophysical survey should be conducted around the tank farm to identify any JP-4 plume. Conduct a continuous core sampling in the dike area extended to the first sand and gravel lens and observe if any JP-4 is present. Then perform a water extract on 3 soil samples and analyze for oil and grease, and total organic carbon.

3) The Fuel-contaminated Soil area indicates that there is a sufficient potential to create environmental contamination and further monitoring of this site is recommended. A geophysical survey should be conducted around the area to define the extent of the fuel plume and to locate its source, if possible. Conduct a continuous core sampling as near to the sites as possible, extended to the first sand and gravel lens (20' to 30' deep) and observe if any JP-4 is present. Then perform a water extract on 3 soil samples and analyze for oil and grease and total organic carbon. If a

TABLE 6.1
GENERAL GUIDELINES FOR USE OF CERTAIN GEOPHYSICAL TECHNIQUES
AT HAZARDOUS WASTE SITES

Geophysical Technique	Limiting Factors[1]		Best Usage Areas[2]	Advantages	Disadvantages
	Surface	Subsurface			
Surface Electrical Resistivity	Asphalt/concrete areas; ponded water.	Pipelines, electrical lines & other conductors; buried containers; most solidifed wastes; highly variable geology; mineralized ground water.	Open field; no surface or subsurface constraints; homogeneous geology.	Vertical & horizontal anomalies identifiable; sounding depth can be relatively accurate; depth range of 300 feet with least expensive equipment.	2- to 3-man operation; relatively time consuming; probes must be placed into soil.
Electromagnetic	Overhead electric lines; structures nearby.	Pipelines, electrical lines & other conductors; buried containers; most solidified wastes; highly variable geology; mineralized ground water.	Open field; no surface or subsurface constraints; homogeneous geology.	One-man operation; relatively quick; no contact with soil.	Depth range 18 feet with least expensive equipment.
Magnetometer	Overhead electric lines; structures nearby.	Pipelines, electrical lines & other conductors; buried containers; most solidified wastes; highly variable geology; mineralized ground water; ferromagnetic bedrock underlying site.	Open field; no surface or subsurface constraints; homogeneous geology; waste containers made from ferromagnetic metal and isolated in pits or trenches.	Horizontal limits of ferromagnetic metal drums and ferromagnetic solid wastes easily identifiable; one-man operation; no contact with soil; depth to target can be estimated.	Only useful to locate ferromagnetic metal targets.

Notes: 1. Technique ineffective if these factors are present at site; data interpretations difficult.
2. Data interpretations relatively uncomplicated if geology is known.

Sources: Breiner, 1973; EPA, 1978; Zohdy and others, 1974.

TABLE 6.2
RECOMMENDED MONITORING PROGRAM FOR PHASE II
O'HARE ARFF

Ranking Number	Site Name	Rating Score	Recommended Monitoring	Comments
1	Landfill No. 1	68	Conduct geophysical survey to define the landfill boundaries and depth and identify any leachate plume. Based on the results of the geophysical survey, install one upgradient and 3 downgradient monitoring wells. Wells should be constructed using 3" Schedule 40 PVC, screened into the first sand and gravel lens (20' to 30' deep). Sample these wells and analyze for pH, TDS, TOX, TOC, and phenol.	Continue monitoring if sampling indicates contamination. Addition wells may be needed.
2	JP-4 Tank Dike Spill	65	Conduct geophysical survey around the tank farm to identify any JP-4 plume. Conduct a continuous core sampling in the dike area extended to the first sand and gravel lens. Observe if any JP-4 is present. Perform a water extract on 3 soil samples and analyze for oil and grease and TOC.	Conduct combined geophysical survey with Landfill No. 1.
3	Fuel-Contaminated Soil	64	Conduct geophysical survey around the site to identify any JP-4 plume. Conduct a continuous core sampling near the site extended to the first sand and gravel lens (20'-30' deep). Observe if any JP-4 is present. Perform a water extract on 3 soils samples and analyze for oil and greas, and TOC.	Coordinate geophysical survey with other site work. If plume is identified locate boring in plume near tank. Monitoring wells may be required if plume identified.
4	Defueling Pit Leak Site	63	Conduct geophysical survey around the site to identify any JP-4 plume. Conduct a continuous core sampling near the site extended to the first sand and gravel lens (20'-30' deep). Observe if any JP-4 is present. Perform a water extract on 3 soil samples and analyze for oil and grease, and TOC.	Coordinate geophysical survey with other site work. If plume is identified locate boring in plume near tank. Monitoring wells may be required if plume identified.
5	Fire Protection Training Area	60	Conduct geophysical survey around the site to identify any leachate plume.	The site is covered by a hardfill; therefore, site monitoring is restricted.
6	Hazardous Waste Storage Area	58	Conduct a continuous core sampling in the center of the site extended to the first sand and gravel lens (20'-30' deep). Observe if contamination present. Perform a water extract of 3 selected soil samples (in contaminated zones if present) and perform analyses for pH, TOX and TOC.	If contamination found, install monitoring well to better characterize contaminants in the ground water.
7	Landfill No. 2	55	Conduct geophysical survey to define the landfill boundaries and depth and identify any leachate plume. Based on the results of the geophysical survey, install one upgradient and two downgradient monitoring wells. Wells should be constructed of 3" Schedule 40 PVC, screened into the first sand and gravel lens (20'-30' deep). Sample these wells and analyze for pH, TOC, TOX, TDS and phenols.	Conduct combined geophysical survey with the Fire Protection Training Area. Continue monitoring if sampling indicates contamination.
8	Storm Drainage System Near Hangars	53	Conduct continuous core sample at the nearest wooden pipe section and at the nearest outfall extended to the first sand and gravel lens. Observe if contamination is present. Perform a water extraction of 3 samples and analyze for TOX, TOC and pH.	If contamination is found, collect and analyze samples from any water standing in the system. Another series of core sampling may be necessary to define the extent of contamination.
9	Spills along South Edge of Main Apron	52	Conduct a continuous core sampling at the edge of the apron extended to the first sand and gravel lens (20'-30' deep). Observe if any contamination present. Perform a water extract on 3 selected soil samples (in contaminated zones if present) and perform analyses for pH, TOX and TOC.	If contamination found in the core samples, collect and analyze surface water and sediment samples in the drainage ditch during high flow period.

plume was identified during the survey, the boring should be located to intercept the plume. Monitoring wells may be required if a plume is identified.

4) The Defueling Pit Leak Site has a sufficient potential to create environmental contamination and further monitoring of the site is recommended. A geophysical survey should be conducted around the site to identify any JP-4 plume. Conduct a continuous core sampling by the site extended to the first sand and gravel lens (20' to 30' deep) and observe if any JP-4 is present. Then perform a water extract on 3 selected soil samples (in the contaminated zone, if present) and analyze for oil and grease, and total organic carbon. If a plume was identified during the survey, the boring should be located to intercept the plume. Monitoring wells may be required if a plume is identified.

5) The Fire Protection Training Area has a sufficient potential to create environmental contamination and further monitoring of the site is recommended. A geophysical survey should be conducted to identify any leachate plume. Further investigation of the site is to be coordinated with that of Landfill No. 2, discussed below.

6) The Hazardous Waste Storage Area has a sufficient potential to create environmental contamination and further monitoring of the site is recommended. Any old drums in the area should be located and examined. Conduct a continuous core sampling in the center of the site extended to the first sand and gravel lens (20' to 30' deep) and observe if contamination present. Perform a water extract of 3 selected soil samples (in contaminated zones if present) and analyze for pH, total organic halogen and total organic carbon.

7) Landfill No. 2 has a sufficient potential to create environmental contamination and further monitoring of the site is recommended. First conduct a geophysical survey (simultaneous with the Fire Protection Training Area, above) to define the landfill boundaries and depth, and identify any leachate plume. Based on the results

of the geophysical survey, install one upgradient and two downgradient monitoring wells. Wells should be constructed of 3" Schedule 40 PVC, screened into the first sand and gravel lens (20' to 30' deep). Sample these wells and analyze for pH, total organic carbon, total organic halogen, total dissolved solids and phenols.

8) The Storm Drainage System in the aircraft hangar area has a sufficient potential to create environmental contamination and further monitoring of the system is recommended. First, the sections which are wooden pipe nearest the hangars should be identified. The nearest outfall should also be identified. Then conduct a continuous core sampling at each point extended to the first sand and gravel lens (20' to 30' deep) and observe if any contamination is present. Perform a water extract on 3 selected soil samples from each point and perform analyses for total organic halogen, total organic carbon, and pH. If contamination is found in either core sample, collect and analyze water samples from any water found standing in the system. Another series of core samples may be necessary to define the extent of any contamination.

9) The Spill Area along the South Edge of the Main Apron has a sufficient potential to create environmental contamination and further monitoring of the site is recommended. First, conduct a continuous core sampling at the edge of the apron extended to the first sand and gravel lens (20' to 30' deep) and observe if any contamination is present. Perform a water extract on 3 selected soil samples in contamination zones if present) and perform analyses for pH, total organic halogen and total organic carbon. If contamination is found in the core samples, collect and analyze surface water and sediment samples in the drainage ditch during a high flow period.

OTHER RECOMMENDATIONS

The following items did not warrant HARM ratings but are significant to the protection of the environmental at O'Hare ARFF. It is recommended that the installation environmental program incorporate these recommendations into its overall plan.

1) The oil/water separator located near Building No. 19 (both the main tank and its overflow tank) should be emptied and it should be verified that the water overflows into the sanitary sewer. Regular monitoring and periodic emptying of this separator is recommended.

2) The location of Hazardous Waste Accumulation Point near the aircraft hangars should be reevaluated in light of the possibility of a spill entering the storm sewer.

3) The abandoned MOGAS tank(s) at the south edge of the Main Apron should be checked for any contents and either removed or filled with sand.

4) A sign should be permanently posted at the low-level radioactive disposal site identifying it as such.

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APPENDICES

APPENDIX A

BIOGRAPHICAL DATA

Biographical Data

DAVID L. GREGORY

Environmental Engineer

PII Redacted

[redacted]

Education

B.S. in Civil Engineering, 1976, University of Cincinnati, Ohio
M.E. in Environmental Systems Engineering, 1978, Clemson University, South Carolina

Professional Affiliations

Engineer-in-Training (Ohio)
Georgia Water Pollution Control Association
Water Pollution Control Federation

Honorary Affiliations

Chi Epsilon

Experience Record

1974-1975 State of Ohio, Department of Transportation, Lebanon, Ohio. Construction Inspector. Responsibilities included inspection of soil work and concrete structures for interstate highway I-471.

1976-1978 Clemson University, Clemson, South Carolina. Graduate Research Assistant (1976-1977). Conducted bench-scale treatability studies on an organic dye manufacturer's wastewater to determine the effects of ozone pretreatment on the kinetics of activated sludge.

Graduate Research Associate (1978). Served as research coordinator and treatment technologist for bench-scale treatability studies of organic dye manufacturing wastewater by ozonation, hyperfiltration, carbon absorption, activated sludge, and powdered activated carbon (PAC) processes. Performed analyses for toxic compounds using atomic absorption and gas chromatography.

1979-1981 GMP Associates, Inc., Honolulu, Hawaii. Project Engineer. Responsible for sampling, data evaluation, review of operating procedures, and development of design and operating modifications for a study on pollution potential of the naval drydock facilities at

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David L. Gregory (Continued)

Pearl Harbor. Involved in a series of troubleshooting studies at municipal wastewater treatment plants which included collection and evaluation of performance data on pump stations, clarifiers, activated sludge units, trickling filters, aerobic and anaerobic digesters, and various dewatering devices and recommendations for improving plant performance through design and operational modifications.

Project Manager. Supervised a study on the source and control of hydrogen sulfide odors at a municipal treatment plant, involving investigation of the wastewater collection system and the treatment plant, an extensive wastewater characterization program, evaluation of ozonation, carbon absorption, and catalytic reduction treatment processes, and recommendation for alternative processes and operating strategies.

1981-Date Engineering-Science. Project Engineer. Developed stormwater control strategies, wastewater treatment design criteria, and a computer model for predicting the hydraulic impact of stormwater flows on the treatment system for an oil refinery NPDES permitting project. Conducted batch and continuous bench scale biological treatability studies on a wastewater stream containing 2,4-D, organic arsenic, and other herbicides, which included extensive wastewater characterization, jar testing of metal salt for arsenic precipitation, ammonia stripping testing, primary settling column testing, and development of a computer model to determine the alkalinity and distribution of carbonate and ammonia species in the wastestream under various conditions of pH and carbonate concentration. Involved in a waste compatability study, design of spill prevention and control features, and determination of health and safety requirements for a photographic lab chemical storage area and a hazardous waste collection system.

Project Manager. In charge of developing a comprehensive Spill Prevention Control and Countermeasure (SPCC) guidance manual and pollution contingency plans for U.S. Air Force bases which involved compliance with hazardous waste regulations and development of procedures for evaluating existing spill prevention and response capabilities. Directed a bioreactor treatability study to evaluate loading rates, PAC addition, and organics removal for the design of the wastewater treatment facilities at a plastics plant to be constructed by General Electric in The Netherlands.

David L. Gregory (Continued)

Papers and Presentations

"Biological Treatability of an Ozonated Dye Manufacture Waste," Master of Engineering Special Problem Report, Clemson University, Environmental Systems Engineering Department, Clemson, South Carolina, 1979.

Biographical Data

H. DAN HARMAN, JR.
Hydrogeologist

PII Redacted

[redacted]

Education

B.S., Geology, 1970, University of Tennessee, Knoxville, TN

Professional Affiliations

Registered Professional Geologist (Georgia NO.569)
National Water Well Association (Certified Water Well Driller No. 2664)
Georgia Ground-Water Association

Experience Record

1975-1977 Northwest Florida Water Management District, Havana, Florida. Hydrogeologist. Responsible for borehole geophysical logger operation and log interpretation. Also reviewed permit applications for new water wells.

1977-1978 Dixie Well Boring Company, Inc., LaGrange, Georgia. Hydrogeologist/Well Driller. Responsible for borehole geophysical logger operation and log interpretation. Also conducted earth resistivity surveys in Georgia and Alabama Piedmont Provinces for locations of water-bearing fractures. Additional responsibilities included drilling with mud and air rotary drilling rigs as well as bucket auger rigs.

1978-1980 Law Engineering Testing Company, Inc., Marietta, Georgia. Hydrogeologist. Responsible for ground-water resource evaluations and hydrogeological field operations for government and industrial clients. A major responsibility was as the Mississippi Field Hydrologist during the installation of both fresh and saline water wells for a regional aquifer evaluation related to the possible storage of high level radio-active waste in the Gulf Coast Salt Domes.

1980-1982 Ecology and Environment, Inc., Decatur, Georgia. Hydrogeologist. Responsible for project management of hydrogeological and geophysical investigations at uncontrolled hazardous waste sites. Also prepared Emergency Action Plans and Remedial Approach Plans for U.S. Environmental Protection Agency. Additional

H. Dan Harman, Jr. (Continued)

responsibilities included use of the MITRE hazardous ranking system to rank sites on the National Superfund List.

1982-1983 NUS Corporation, Tucker, Georgia. Hydrogeologist. Responsible for project management of hydrogeological and geophysical investigations at uncontrolled hazardous waste sites.

1983-Date Engineering-Science, Inc., Atlanta, Georgia. Hydrogeologist. Responsible for hydrogeological evaluations during Phase I Installation Restoration Program projects for the Department of Defense.

Publications and Presentations

"Geophysical Well Logging: An Aid in Georgia Ground-Water Projects," 1977, coauthor: D. Watson, The Georgia Operator, Georgia Water and Pollution Control Association.

"Use of Surface Geophysical Methods Prior to Monitor Well Drilling," 1981. Presented to Fifth Southeastern Ground-Water Conference, Americus, Georgia.

"Cost-Effective Preliminary Leachate Monitoring at an Uncontrolled Hazardous Waste Site," 1982, coauthor: S. Hitchcock. Presented to Third National Conference on Management of Uncontrolled Hazardous Waste Sites, Washington, D.C.

"Application of Geophysical Techniques as a Site Screening Procedure at Hazardous Waste Sites," 1983, coauthor: S. Hitchcock. Proceedings of the Third National Symposion and Exposition on Aquifer Restoration and Ground-Water Monitoring, Columbus, Ohio.

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Biographical Data

ROBERT J. REIMER

Chemical Engineer

PII Redacted

[redacted]

Education

B.S. in Chemical Engineering, 1979, University of Notre Dame
B.A. in Art, 1979, University of Notre Dame
M.S. in Chemical Engineering, 1980, University of Notre Dame

Honors

Amoco Company Fellowship for Graduate Studies in Chemical Engineering, University of Notre Dame (1979-1980)

Professional Affiliations

American Institute of Chemical Engineers

Experience Record

1978-1979 PEDCo Environmental, Cincinnati. Engineer's Assistant. Responsible for compilation of data base report reviewing solid waste disposal in the nonferrous smelting industry. Participated in SO_2 scrubber emissions testing program, Columbus, Ohio. Worked on team establishing a computerized reference file on the overall smelting industry. Performed technical editing and report review.

1979-1980 Camargo Associates, Ltd., Cincinnati. Design Engineer and Draftsman. Responsible for HVAC design on numerous projects. Designed fire protection system for an industrial plastics press. Designer on various general plumbing jobs. Prepared EPA air pollution permit applications.

1980-Date Engineering-Science. Chemical Engineer. Responsible for the preparation of environmental reports and permit documents as well as providing general environmental assistance to clients to assure compliance with state and federal regulations.

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Robert J. Reimer (Continued)

1980-Date Developed cost estimates for several hazardous waste management facility closures. Prepared several Interim Status Standards Manuals, including Manifest Plans, Waste Analysis Plans, Closure Plans and Contingency/ Emergency Plans. Provided technical assistance in the design of a one-million gallon per year fuel alcohol production facility.

Provided assistance for a water reuse/reduction plan at a major petroleum refinery. Conducted an extensive review of emerging energy technologies for the Department of Energy. Participated in several Installation Restoration Programs for the U. S. Air Force. Assisted in the design of a contaminated ground water air stripping column based on a lab model to be developed. Prepared several delisting petitions for the removal of industrial wastestreams from EPA's hazardous waste list. Assisted in a study of waste oil reuse for the U.S. Army CERL.

APPENDIX B

LIST OF INTERVIEWEES

APPENDIX B
LIST OF INTERVIEWEES

O'Hare ARFF

	Position	Years of Service
1.	Environmental Coordinator, Civil Engineering Squadron	3
2.	Civilian Supervisor, Consolidated Aircraft Maintenance Squadron	38
3.	Fire Chief, Fire Department	9
4.	Supervisor Fuels Management	22
5.	Vehicle Maintenance	24
6.	TAG Clinic	5
7.	Civil Engineering Squadron	37
8.	Supervisor, Fuel Maintenance	13
9.	Supervisor, Vehicle Maintenance	37
10.	Civil Engineering Squadron	36
11.	Civil Engineering Squadron	37
12.	ILANG	6
13.	Heavy Equipment Operator, Civil Engineering Squadron	14
14.	Fuels Maintenance	4
15.	Base Supply	32
16.	Aircraft Maintenance Squadron	28
17.	Chief Engineer, Civil Engineering Squadron	3
18.	Supervisor, Aircraft Maintenance Squadron	33
19.	Supervisor, Material and Equipment Inspector	27

Position		Years of Service
20.	Fire Chief (Ret.), Fire Department	24
21.	Supervisor, Ground Safety	34
22.	Supervisor, Aircraft Maintenance	34
23.	Supervisor, Electric Shop, Civil Engineering Squadron	33
24.	Aircraft Maintenance	30
25.	Command Post	23
26.	Base Civil Engineer, Civil Engineering Squadron	21

OUTSIDE AGENCIES

Illinois EPA

Jack Barnetts	Emergency Response	
Eva Howard	Envir. Services Division	312/886-6233
Don Clopke	Water Pollution Sec.	312/345-9780

USEPA

John Oaks	Superfund Office	312/886-6156
Gale Hrufka	Waste Management Sec.	312/886-6138

City of Chicago

Bob Valiquet	Department of Aviation	312/686-2268

Illinois Dept. of Energy and Natural Resources
State Water Survey Division

Robert Sasman	Hydrologist	312/879-6466

Illinois Dept. of Conservation

Mike Sweet	Geologist	217/782-6424

APPENDIX C

ORGANIZATIONS AND MISSIONS

APPENDIX C
ORGANIZATIONS AND MISSIONS

PRIMARY ORGANIZATION AND MISSION

The primary mission of the 928th Tactical Air Group is to provide individual and unit training in the C-130A, tactical airlift support for airborne forces, equipment, supplies and aeromedical evacuation within the theater of operations. The Group also operates and maintains the Air Force complex at O'Hare International Airport, represents the Air Force in the Chicago metropolitan area, and provides support to various tenant units.

TENANT ORGANIZATIONS AND MISSIONS

The O'Hare Air Reserve Forces Facility is host to several tenant organizations and provides facilities, services and other support to these organizations. The following list identifies the major tenant organizations and briefly describes their missions.

126th Air Refueling Wing, Illinois Air National Guard (Ill ANG)

The primary mission is to provide ground and aerial refueling, using Boeing KC-135, and to maintain maximum combat readiness at minimum cost. Other missions include fly-in ground servicing, personnel transport, emergency air evacuation, and cargo transport. The Wing advises and assists State authorities in the administration, logistics, training and operation of the military air forces. The Wing also participates in joint exercises and maneuvers, and provides disaster relief in domestic emergencies.

264th Mobile Communicatons Squadron, Ill ANG

The primary mission of the Squadron is the installation, operation and maintenance of radio relays and mobile radio relay terminals at unprepared sites, including VHF or UHF/FM microwave and topospheric scatter equipment. The Squadron is also responsible for the installation, operation, and maintenance of radio communications tributary teams, including telephone, teletype and communications center functions.

217th Electronics Installation Squadron, Ill ANG

The Squadron is responsible for installation and maintenance of ground communication-electronics equipment. The squadron consists of four ground radio communications equipment teams, two telephone switching teams, eight outside wire and antenna systems teams and sixteen cable splicing teams.

36th Medical Service Evacuation Squadron

This Squadron trains to fulfill its wartime mission of providing aeromedical staging at fixed medical facilities or other designated locations.

USAF Liaison Office/National Scouting Organization

This office administers the USAF program of cooperation with the Boy Scouts of America. The office acts as liaison between Air Force installations and scouts within Boy Scout Region VII (Illinois, Indiana, Michigan, Wisconsin and eastern Iowa).

Additional Tenants

Defense Contract Administration Services Region

Defense Logistics Agency

Headquarters, Ill ANG

126th Combat Support Group, Ill ANG

126th Consolidated Aircraft Maintenance Squadron, Ill ANG

126th USAF Clinic, Ill ANG

126th Civil Engineering Flight, Ill ANG

566th USAF Band, Ill ANG

Aeronautical Systems Division, Reserve Detachment (AFLC)

Corps of Engineers Field Office

APPENDIX D

POL TANK INFORMATION

APPENDIX D

POL TANK INFORMATION

Location (Facility No)	Product	Volume (Gal)	Comment
2900	Diesel	60,000	
2900	MOGAS (unleaded)	10,000	
2900	MOGAS (regular)	10,000	
2902 (170)	JP-4	210,000	
2902 (171)	JP-4	50,000	Underground
2902 (172)	JP-4	50,000	Underground
2903	JP-4	25,000	Diked
2903	JP-4	25,000	Diked
2903	JP-4	25,000	Diked
2903	JP-4	25,000	Diked
2903	JP-4	25,000	Diked
2903	JP-4	25,000	Diked
2903	JP-4	25,000	Diked
2903	JP-4	25,000	Diked
2903	JP-4	25,000	Diked
2903	JP-4	11,500	Diked
2903	JP-4	11,500	Diked
2903	FS-2	25,000*	Diked
2903	FS-5	12,000	Tank car

* Split compartment tank (12,500-gallons each compartment); 12,500 gallons of FS-2 in one compartment; other compartment is nearly empty.

APPENDIX E

MASTER LIST OF INDUSTRIAL SHOPS

APPENDIX E
MASTER LIST OF INDUSTRIAL SHOPS
O'HARE ARFF

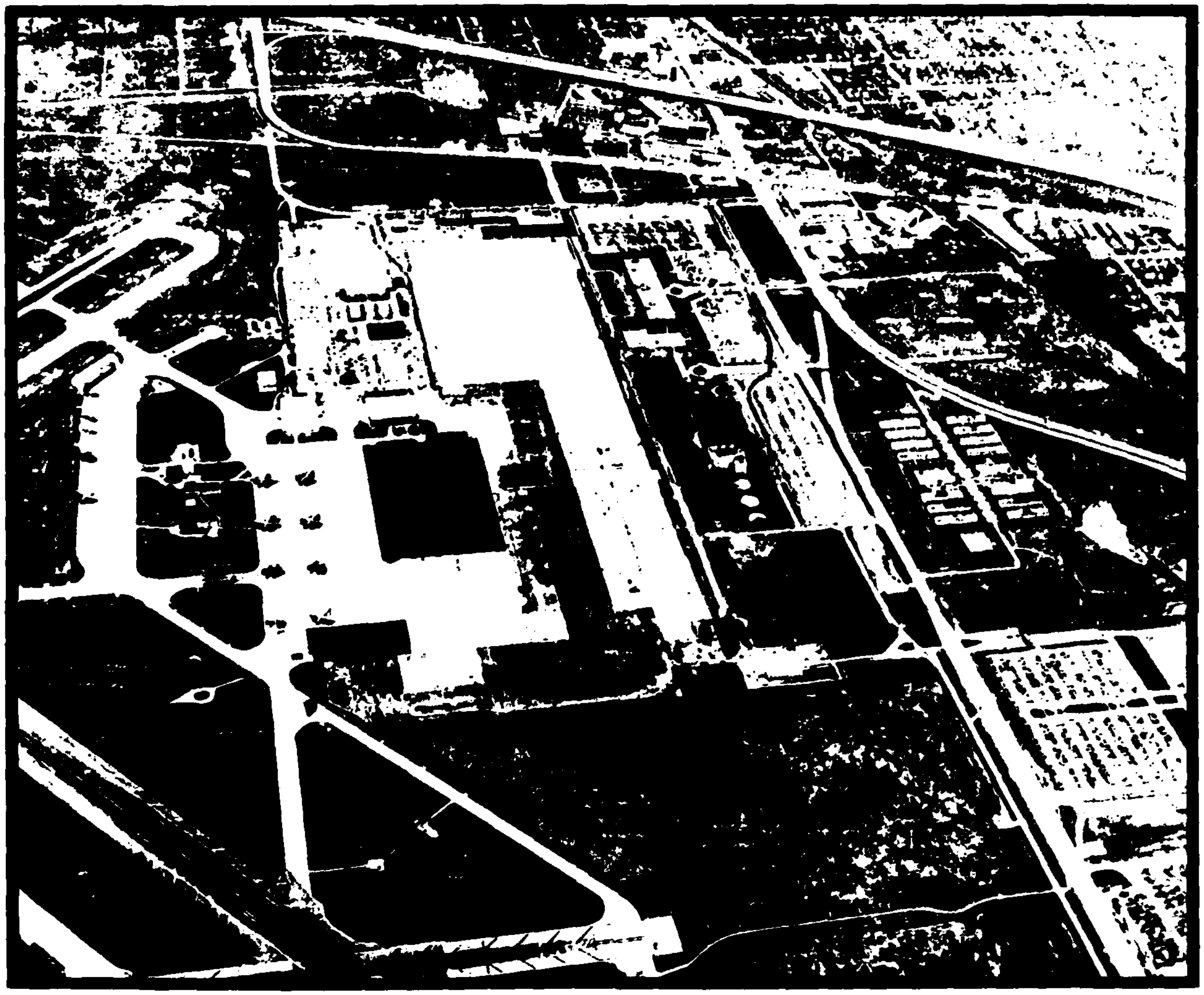
Name	Present Location (Bldg. No.)	Handles Hazardous Materials	Generates Hazardous Waste	Current TSD Method
AGE Shop	33	Yes	Yes	Contractor/Sanitary Sewer
AGE Shop*	24	Yes	Yes	Contractor/Sanitary Sewer
Vehicle Maintenance*	5	Yes	Yes	Contractor
Avionics	30	No	No	---
Avionics*	27	No	No	---
Battery/Electrical Shop	31	Yes	Yes	Contractor/Sanitary Sewer
Carpenter Shop	10	Yes	No	---
Corrosion Control	30	Yes	Yes	Contractor/General Refuse
Exterior/Interior Electric	10	No	No	---
Engine Shop	34	Yes	Yes	Contractor
Engine Shop*	70	Yes	Yes	Contractor
Fire Department	63	Yes	Yes	Contractor
Fuel Cell	35	Yes	Yes	Contractor/Internal Recycle
Fuel (POL) Storage	66	Yes	Yes	Contractor/Internal Recycle
Hangar Facility*	19	Yes	No	---
Life Support Shop	3	Yes	No	---
Machine Shop	30	Yes	Yes	Contractor

Name	Present Location (Bldg. No.)	Handles Hazardous Materials	Generates Hazardous Waste	Current TSD Method
Non-Destructive Inspection Shop	59	Yes	Yes	Sanitary Sewer
Packing and Crating	32	Yes	No	---
Painting Shop	10	Yes	No	---
Plumbing Shop	10	Yes	No	---
Pneudraulics Shop	30	Yes	Yes	Contractor
Prop. Shop	34	Yes	Yes	Contractor
Repair and Reclamation	30	Yes	Yes	Contractor
Refrigeration Shop	58	Yes	No	---
Roads and Grounds Shop	55	Yes	Yes	Contractor
Rocket Storage Facility**	411	Yes	No	---
Sheet Metal Fabrication	10	No	No	---
Stock Room/ Supply*	21,22,23	Yes	No	---
Survival Equipment Shop	61	Yes	No	---
Vehicle Maintenance Facility	50	Yes	Yes	Contractor/Sanitary Sewer
Vehicle Maintenance Facility*	12	Yes	Yes	Contractor/Sanitary Sewer
Welding Shop	30	No	No	---

* Air National Guard Facility
** Former Air National Guard Facility, no longer in use.

APPENDIX F

PHOTOGRAPHS



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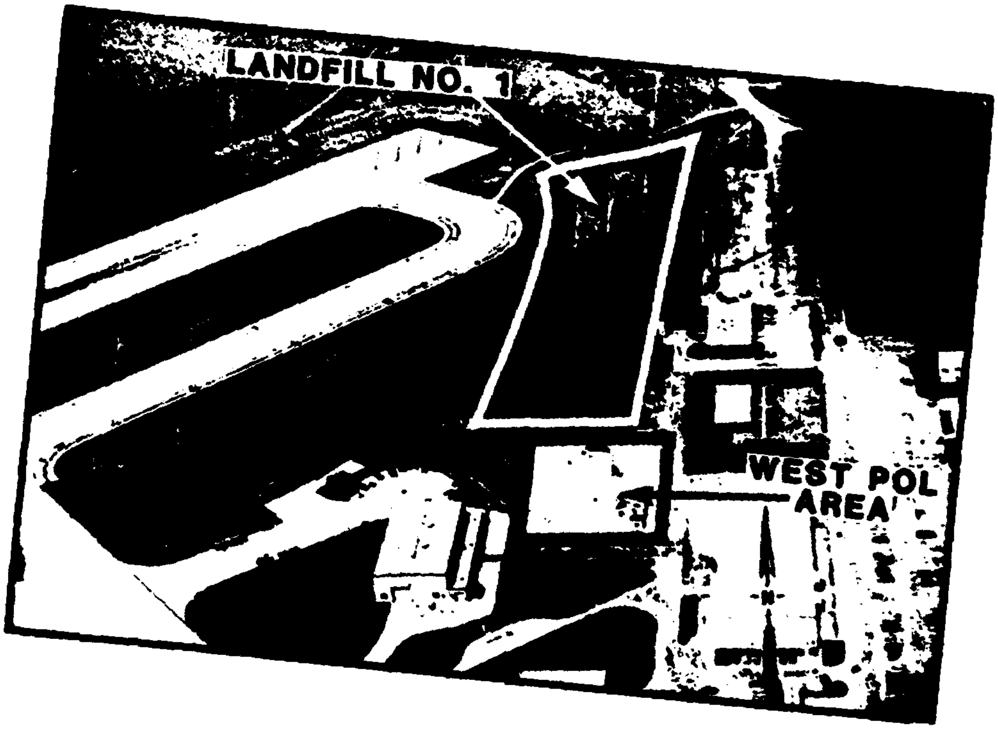
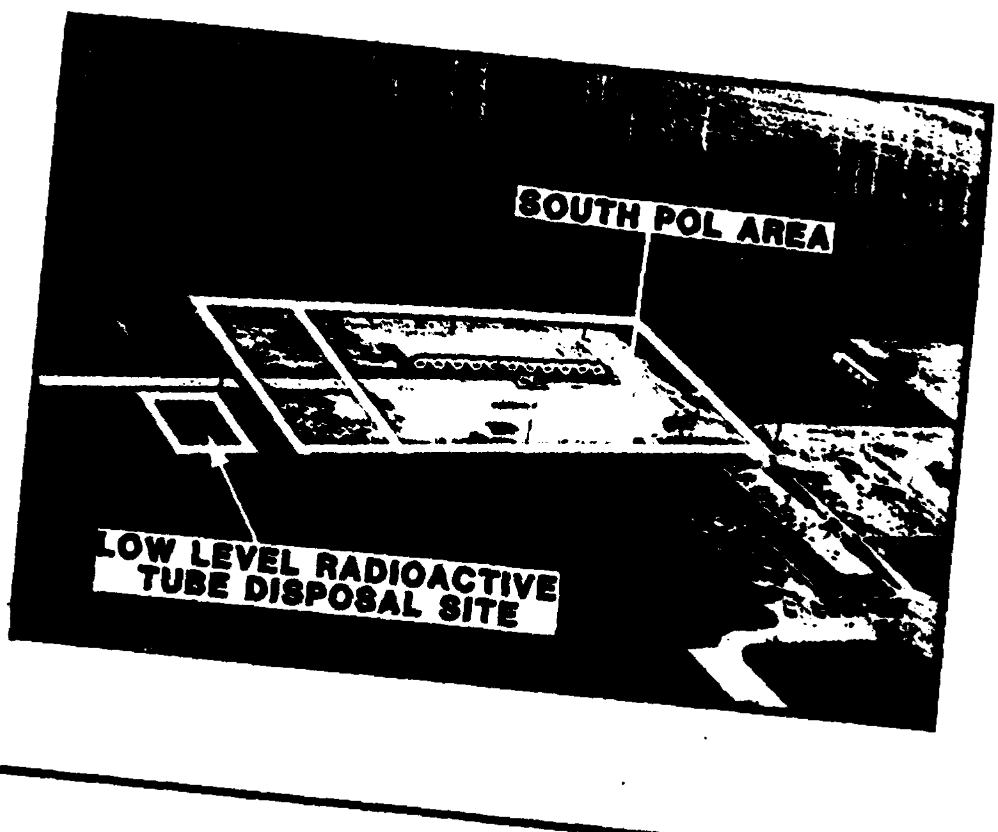
O'HARE

Air Reserve Forces Facility

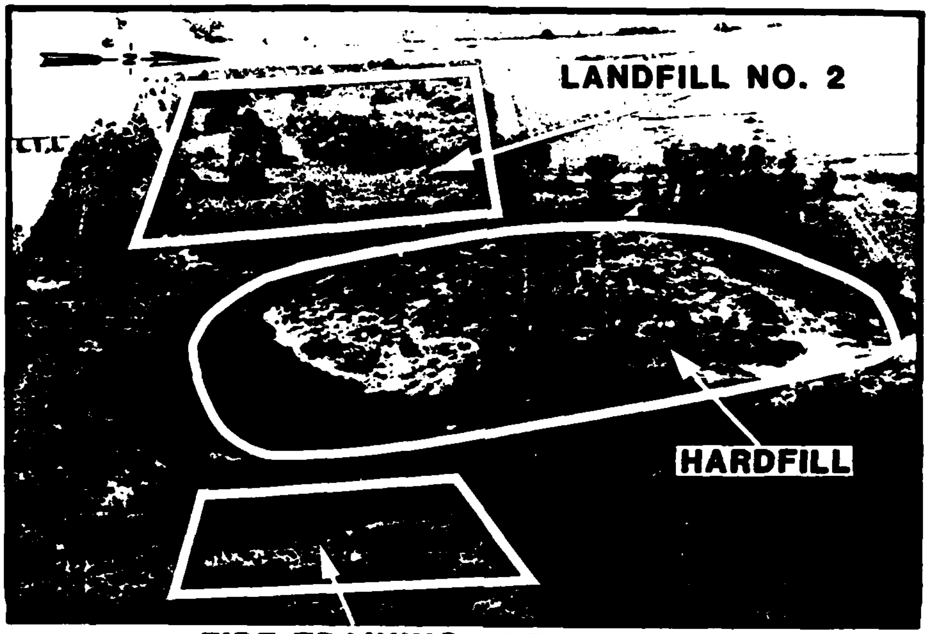
AERIAL PHOTO MID 1970's

O'HARE ARFF


LANDFILL NO. 1
WEST POL
AREA


SOUTH POL AREA
LOW LEVEL RADIOACTIVE
TUBE DISPOSAL SITE

O'HARE ARFF



FIRE TRAINING AREA
(APPROXIMATE LOCATION)

O'HARE ARFF

Hazardous Waste Drum Storage Area

APPENDIX G

USAF INSTALLATION RESTORATION PROGRAM

HAZARD ASSESSMENT RATING METHODOLOGY

APPENDIX G

USAF INSTALLATION RESTORATION PROGRAM
HAZARD ASSESSMENT RATING METHODOLOGY

BACKGROUND

The Department of Defense (DOD) has established a comprehensive program to identify, evaluate, and control problems associated with past disposal practices at DOD facilities. One of the actions required under this program is to:

> "develop and maintain a priority listing of contaminated installations and facilities for remedial action based on potential hazard to public health, welfare, and environmental impacts." (Reference: DEQPPM 81-5, 11 December 1981).

Accordingly, the United States Air Force (USAF) has sought to establish a system to set priorities for taking further actions at sites based upon information gathered during the Records Search phase of its Installation Restoration Program (IRP).

The first site rating model was developed in June 1981 at a meeting with represenatives from USAF Occupational and Environmental Health Laboratory (OEHL), Air Force Engineering and Services Center (AFESC), Engineering-Science (ES) and CH2M Hill. The basis for this model was a system developed for EPA by JRB Associates of McLean, Virginia. The JRB model was modified to meet Air Force needs.

After using this model for 6 months at over 20 Air Force installations, certain inadequacies became apparent. Therefore, on January 26 and 27, 1982, representatives of USAF OEHL, AFESC, various major commands, Engineering-Science, and CH2M Hill met to address the inadequacies. The result of the meeting was a new site rating model designed to present a better picture of the hazards posed by sites at Air Force installations. The new rating model described in this presentation is referred to as the Hazard Assessment Rating Methodology.

PURPOSE

The purpose of the site rating model is to provide a relative ranking of sites of suspected contamination from hazardous substances. This model will assist the Air Force in setting priorities for follow-on site investigations and confirmation work under Phase II of the IRP.

This rating system is used only after it has been determined that (1) potential for contamination exists (hazardous wastes present in sufficient quantity), and (2) potential for migration exists. A site can be deleted from consideration for rating on either basis.

DESCRIPTION OF MODEL

Like the other hazardous waste site ranking models, the U.S. Air Force's site rating model uses a scoring system to rank sites for priority attention. However, in developing this model, the designers incorporated some special features to meet specific DOD program needs.

The model uses data readily obtained during the Records Search portion (Phase I) of the IRP. Scoring judgments and computations are easily made. In assessing the hazards at a given site, the model develops a score based on the most likely routes of contamination and the worst hazards at the site. Sites are given low scores only if there are clearly no hazards at the site. This approach meshes well with the policy for evaluating and setting restrictions on excess DOD properties.

As with the previous model, this model considers four aspects of the hazard posed by a specific site: the possible receptors of the contamination, the waste and its characteristics, potential pathways for waste contaminant migration, and any efforts to contain the contaminants. Each of these categories contains a number of rating factors that are used in the overall hazard rating.

The receptors category rating is calculated by scoring each factor, multiplying by a factor weighting constant and adding the weighted scores to obtain a total category score.

The pathways category rating is based on evidence of contaminant migration or an evaluation of the highest potential (worst case) for contaminant migration along one of three pathways. If evidence of contaminant migration exists, the category is given a subscore of 80 to 100 points. For indirect evidence, 80 points are assigned and for direct evidence, 100 points are assigned. If no evidence is found, the highest score among three possible routes is used. These routes are surface water migration, flooding, and ground-water migration. Evaluation of each route involves factors associated with the particular migration route. The three pathways are evaluated and the highest score among all four of the potential scores is used.

The waste characteristics category is scored in three steps. First, a point rating is assigned based on an assessment of the waste quantity and the hazard (worst case) associated with the site. The level of confidence in the information is also factored into the assessment. Next, the score is multiplied by a waste persistence factor, which acts to reduce the score if the waste is not very persistent. Finally, the score is further modified by the physical state of the waste. Liquid wastes receive the maximum score, while scores for sludges and solids are reduced.

The scores for each of the three categories are then added together and normalized to a maximum possible score of 100. Then the waste management practice category is scored. Sites at which there is no containment are not reduced in score. Scores for sites with limited containment can be reduced by 5 percent. If a site is contained and well managed, its score can be reduced by 90 percent. The final site score is calculated by applying the waste management practices category factor to the sum of the scores for the other three categories.

FIGURE 1

HAZARD ASSESSMENT RATING METHODOLOGY FLOW CHART

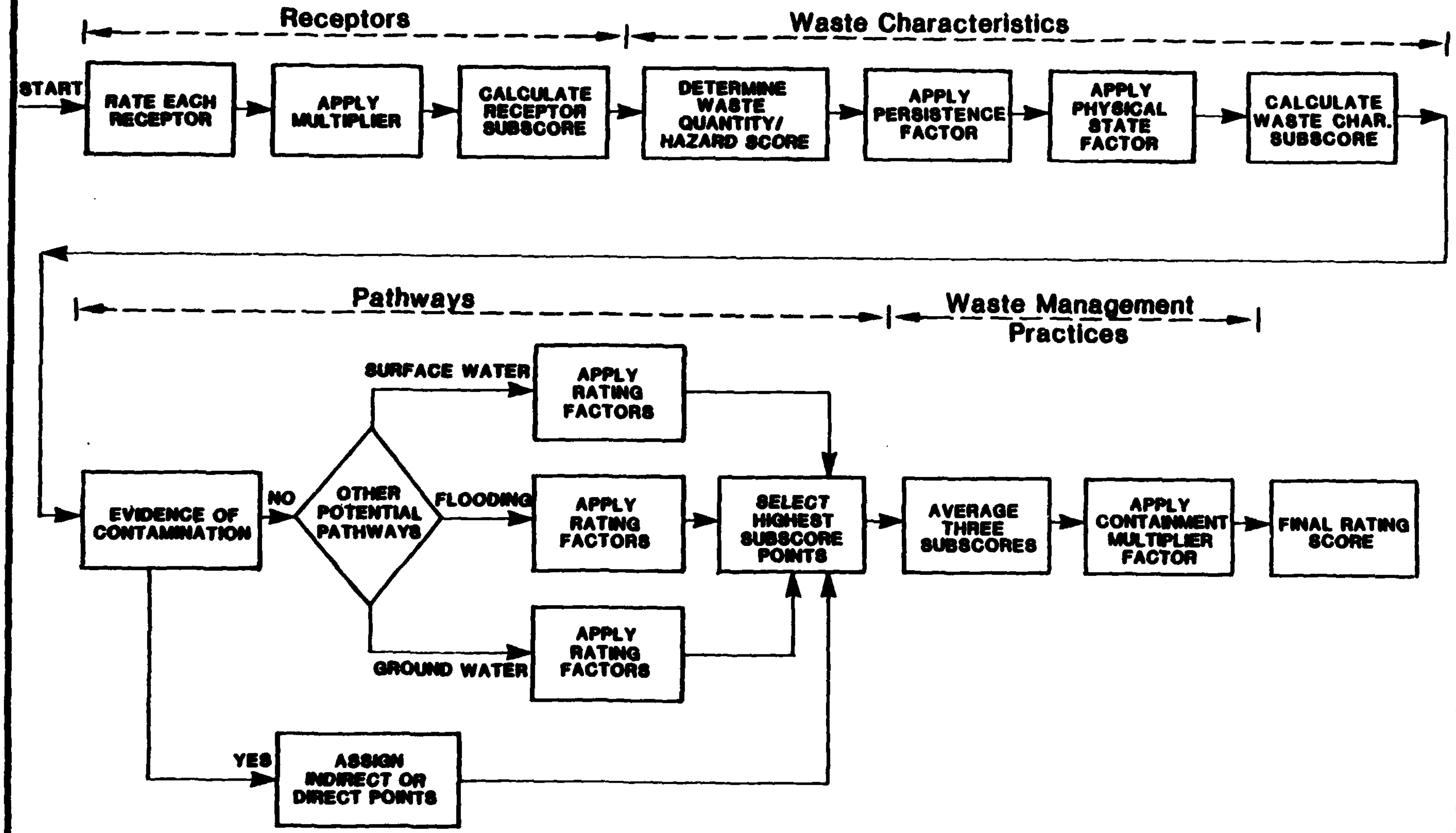


FIGURE 2

HAZARD ASSESSMENT RATING METHODOLOGY FORM

NAME OF SITE ____________________

LOCATION ____________________

DATE OF OPERATION OR OCCURRENCE ____________________

OWNER/OPERATOR ____________________

COMMENTS/DESCRIPTION ____________________

SITE RATED BY ____________________

I. RECEPTORS

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
A. Population within 1,000 feet of site		4		
B. Distance to nearest well		10		
C. Land use/zoning within 1 mile radius		3		
D. Distance to reservation boundary		6		
E. Critical environments within 1 mile radius of site		10		
F. Water quality of nearest surface water body		6		
G. Ground water use of uppermost aquifer		9		
H. Population served by surface water supply within 3 miles downstream of site		6		
I. Population served by ground-water supply within 3 miles of site		6		
		Subtotals	____	____

Receptors subscore (100 X factor score subtotal/maximum score subtotal) ____

II. WASTE CHARACTERISTICS

A. Select the factor score based on the estimated quantity, the degree of hazard, and the confidence level of the information.

1. Waste quantity (S = small, M = medium, L = large) ____
2. Confidence level (C = confirmed, S = suspected) ____
3. Hazard rating (H = high, M = medium, L = low) ____

Factor Subscore A (from 20 to 100 based on factor score matrix) ____

B. Apply persistence factor
Factor Subscore A X Persistence Factor = Subscore B

____ X ____ = ____

C. Apply physical state multiplier

Subscore B X Physical State Multiplier = Waste Characteristics Subscore

____ X ____ = ____

FIGURE 2 (Continued)

III. PATHWAYS

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score

A. If there is evidence of migration of hazardous contaminants, assign maximum factor subscore of 100 points for direct evidence or 80 points for indirect evidence. If direct evidence exists then proceed to C. If no evidence or indirect evidence exists, proceed to B.

Subscore ______

B. Rate the migration potential for 3 potential pathways: surface water migration, flooding, and ground-water migration. Select the highest rating, and proceed to C.

1. Surface water migration

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
Distance to nearest surface water		8		
Net precipitation		6		
Surface erosion		8		
Surface permeability		6		
Rainfall intensity		8		

Subtotals ______ ______

Subscore (100 X factor score subtotal/maximum score subtotal) ______

2. Flooding

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
Flooding		1		

Subscore (100 x factor score/3) ______

3. Ground-water migration

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
Depth to ground water		8		
Net precipitation		6		
Soil permeability		8		
Subsurface flows		8		
Direct access to ground water		8		

Subtotals ______ ______

Subscore (100 x factor score subtotal/maximum score subtotal) ______

C. Highest pathway subscore.

Enter the highest subscore value from A, B-1, B-2 or B-3 above.

Pathways Subscore ______

IV. WASTE MANAGEMENT PRACTICES

A. Average the three subscores for receptors, waste characteristics, and pathways.

Receptors ______
Waste Characteristics ______
Pathways ______

Total ______ divided by 3 = ______
Gross Total Score

B. Apply factor for waste containment from waste management practices

Gross Total Score X Waste Management Practices Factor = Final Score

______ X ______ = [ ]

TABLE 1

HAZARD ASSESSMENT RATING METHODOLOGY GUIDELINES

I. RECEPTORS CATEGORY

Rating Factors	Rating Scale Levels 0	1	2	3	Multiplier
A. Population within 1,000 feet (includes on-base facilities)	0	1 - 25	26 - 100	Greater than 100	4
B. Distance to nearest water well	Greater than 3 miles	1 to 3 miles	3,001 feet to 1 mile	0 to 3,000 feet	10
C. Land Use/Zoning (within 1 mile radius)	Completely remote (zoning not applicable)	Agricultural	Commercial or industrial	Residential	3
D. Distance to installation boundary	Greater than 2 miles	1 to 2 miles	1,001 feet to 1 mile	0 to 1,000 feet	6
E. Critical environments (within 1 mile radius)	Not a critical environment	Natural areas	Pristine natural areas; minor wetlands; preserved areas; presence of economically important natural resources susceptible to contamination.	Major habitat of an endangered or threatened species; presence of recharge area; major wetlands.	10
F. Water quality/use designation of nearest surface water body	Agricultural or industrial use.	Recreation, propagation and management of fish and wildlife.	Shellfish propagation and harvesting.	Potable water supplies	6
G. Ground-Water use of uppermost aquifer	Not used, other sources readily available.	Commercial, industrial, or irrigation, very limited other water sources.	Drinking water, municipal water available.	Drinking water, no municipal water available; commercial, industrial, or irrigation, no other water source available.	9
H. Population served by surface water supplies within 3 miles downstream of site	0	1 - 50	51 - 1,000	Greater than 1,000	6
I. Population served by aquifer supplies within 3 miles of site	0	1 - 50	51 - 1,000	Greater than 1, 000	6

TABLE 1 (Continued)

HAZARD ASSESSMENT RATING METHODOLOGY GUIDELINES

II. WASTE CHARACTERISTICS

A-1 Hazardous Waste Quantity

S = Small quantity (<5 tons or 20 drums of liquid)
M = Moderate quantity (5 to 20 tons or 21 to 85 drums of liquid)
L = Large quantity (>20 tons or 85 drums of liquid)

A-2 Confidence Level of Information

C = Confirmed confidence level (minimum criteria below)

- o Verbal reports from interviewer (at least 2) or written information from the records.
- o Knowledge of types and quantities of wastes generated by shops and other areas on base.
- o Based on the above, a determination of the types and quantities of waste disposed of at the site.

S = Suspected confidence level

- o No verbal reports or conflicting verbal reports and no written information from the records.
- o Logic based on a knowledge of the types and quantities of hazardous wastes generated at the base, and a history of past waste disposal practices indicate that these wastes were disposed of at a site.

A-3 Hazard Rating

Hazard Category	Rating Scale Levels 0	1	2	3
Toxicity	Sax's Level 0	Sax's Level 1	Sax's Level 2	Sax's Level 3
Ignitability	Flash point greater than 200°F	Flash point at 140°F to 200°F	Flash point at 80°F to 140°F	Flash point less than 80°F
Radioactivity	At or below background levels	1 to 3 times background levels	3 to 5 times background levels	Over 5 times background levels

Use the highest individual rating based on toxicity, ignitability and radioactivity and determine the hazard rating.

Hazard Rating	Points
High (H)	3
Medium (M)	2
Low (L)	1

TABLE 1 (Continued)

HAZARD ASSESSMENT RATING METHODOLOGY GUIDELINES

II. WASTE CHARACTERISTICS (Continued)

Waste Characteristics Matrix

Point Rating	Hazardous Waste Quantity	Confidence Level of Information	Hazard Rating
100	L	C	H
80	L	C	M
	M	C	H
70	L	S	H
60	S	C	H
	M	C	M
50	L	S	M
	L	C	L
	M	S	H
	S	C	M
40	S	S	H
	M	S	M
	M	C	L
	L	S	L
30	S	C	L
	M	S	L
	S	S	M
20	S	S	L

Notes:
For a site with more than one hazardous waste, the waste quantities may be added using the following rules:
Confidence Level
- o Confirmed confidence levels (C) can be added
- o Suspected confidence levels (S) can be added
- o Confirmed confidence levels cannot be added with suspected confidence levels

Waste Hazard Rating
- o Wastes with the same hazard rating can be added
- o Wastes with different hazard ratings can only be added in a downgrade mode, e.g., MCM + SCH = LCM if the total quantity is greater than 20 tons.

Example: Several wastes may be present at a site, each having an MCM designation (60 points). By adding the quantities of each waste, the designation may change to LCM (80 points). In this case, the correct point rating for the waste is 80.

B. Persistence Multiplier for Point Rating

Persistence Criteria	Multiply Point Rating From Part A by the Following
Metals, polycyclic compounds, and halogenated hydrocarbons	1.0
Substituted and other ring compounds	0.9
Straight chain hydrocarbons	0.8
Easily biodegradable compounds	0.4

C. Physical State Multiplier

Physical State	Multiply Point Total From Parts A and B by the Following
Liquid	1.0
Sludge	0.75
Solid	0.50

TABLE 1 (Continued)

HAZARD ASSESSMENT RATING METHODOLOGY GUIDELINES

III. PATHWAYS CATEGORY

A. Evidence of Contamination

Direct evidence is obtained from laboratory analyses of hazardous contaminants present above natural background levels in surface water, ground water, or air. Evidence should confirm that the source of contamination is the site being evaluated.

Indirect evidence might be from visual observation (i.e., leachate), vegetation stress, sludge deposits, presence of taste and odors in drinking water, or reported discharges that cannot be directly confirmed as resulting from the site, but the site is greatly suspected of being a source of contamination.

B-1 POTENTIAL FOR SURFACE WATER CONTAMINATION

Rating Factor	Rating Scale Levels 0	1	2	3	Multiplier
Distance to nearest surface water (includes drainage ditches and storm sewers)	Greater than 1 mile	2,001 feet to 1 mile	501 feet to 2,000 feet	0 to 500 feet	8
Net precipitation	Less than -10 in.	-10 to + 5 in.	+5 to +20 in.	Greater than +20 in.	6
Surface erosion	None	Slight	Moderate	Severe	8
Surface permeability	0% to 15% clay ($>10^{-2}$ cm/sec)	15% to 30% clay (10^{-2} to 10^{-4} cm/sec)	30% to 50% clay (10^{-4} to 10^{-6} cm/sec)	Greater than 50% clay ($<10^{-6}$ cm/sec)	6
Rainfall intensity based on 1 year 24-hr rainfall	<1.0 inch	1.0-2.0 inches	2.1-3.0 inches	>3.0 inches	8
B-2 POTENTIAL FOR FLOODING					
Floodplain	Beyond 100-year floodplain	In 25-year floodplain	In 10-year floodplain	Floods annually	1

B-3 POTENTIAL FOR GROUND-WATER CONTAMINATION

Rating Factor	0	1	2	3	Multiplier
Depth to ground water	Greater than 500 ft	50 to 500 feet	11 to 50 feet	0 to 10 feet	8
Net precipitation	Less than -10 in.	-10 to +5 in.	+5 to +20 in.	Greater than +20 in.	6
Soil permeability	Greater than 50% clay ($>10^{-6}$ cm/sec)	30% to 50% clay (10^{-4} to 10^{-6} cm/sec)	15% to 30% clay (10^{-2} to 10^{-4} cm/sec)	0% to 15% clay ($<10^{-2}$ cm/sec)	8
Subsurface flows	Bottom of site greater than 5 feet above high ground-water level	Bottom of site occasionally submerged	Bottom of site frequently submerged	Bottom of site located below mean ground-water level	8
Direct access to ground water (through faults, fractures, faulty well casings, subsidence fissures, etc.)	No evidence of risk	Low risk	Moderate risk	High risk	8

TABLE 1 (Continued)

HAZARD ASSESSMENT RATING METHODOLOGY GUIDELINES

IV. WASTE MANAGEMENT PRACTICES CATEGORY

A. This category adjusts the total risk as determined from the receptors, pathways, and waste characteristics categories for waste management practices and engineering controls designed to reduce this risk. The total risk is determined by first averaging the receptors, pathways, and waste characteristics subscores.

B. WASTE MANAGEMENT PRACTICES FACTOR

The following multipliers are then applied to the total risk points (from A):

Waste Management Practice	Multiplier
No containment	1.0
Limited containment	0.95
Fully contained and in full compliance	0.10

Guidelines for fully contained:

Landfills:

- o Clay cap or other impermeable cover
- o Leachate collection system
- o Liners in good condition
- o Adequate monitoring wells

Spills:

- o Quick spill cleanup action taken
- o Contaminated soil removed
- o Soil and/or water samples confirm total cleanup of the spill

Surface Impoundments:

- o Liners in good condition
- o Sound dikes and adequate freeboard
- o Adequate monitoring wells

Fire Proection Training Areas:

- o Concrete surface and berms
- o Oil/water separator for pretreatment of runoff
- o Effluent from oil/water separator to treatment plant

General Note: If data are not available or known to be complete the factor ratings under items I-A through I, III-B-1 or III-B-3, then leave blank for calculation of factor score and maximum possible score.

APPENDIX H

HAZARD ASSESSMENT RATING FORMS

TABLE OF CONTENTS

HAZARD ASSESSMENT RATING FORMS
O'HARE ARFF

HAZARD ASSESSMENT RATING METHODOLOGY FORM

Name of Site: LANDFILL NO. 1
Location: NORTHWEST AREA OF BASE
Date of Operation or Occurrence: 1953 TO 1960'S
Owner/Operator: OHARE ARFF
Comments/Description: TRENCH AND FILL TYPE

Site Rated by: GREGORY, McLEOD & REIMER

I. RECEPTORS

Rating Factor	Factor Rating (0-3)	Multi-plier	Factor Score	Maximum Possible Score
A. Population within 1,000 feet of site	3	4	12	12
B. Distance to nearest well	1	10	10	30
C. Land use/zoning within 1 mile radius	3	3	9	9
D. Distance to reservation boundry	3	6	18	18
E. Critical environments within 1 mile radius of site	3	10	30	30
F. Water quality of nearest surface water body	1	6	6	18
G. Ground water use of uppermost aquifer	0	9	0	27
H. Population served by surface water supply within 3 miles downstream of site	0	6	0	18
I. Population served by ground-water supply within 3 miles of site	3	6	18	18
Subtotals			103	180

Receptors subscore (100 x factor score subtotal/maximum score subtotal) 57

II. WASTE CHARACTERISTICS

A. Select the factor score based on the estimated quantity, the degree of hazard, and the confidence level of the information.

1. Waste quantity (1=small, 2=medium, 3=large) 3
2. Confidence level (1=confirmed, 2=suspected) 1
3. Hazard rating (1=low, 2=medium, 3=high) 3

Factor Subscore A (from 20 to 100 based on factor score matrix) 100

B. Apply persistence factor
Factor Subscore A x Persistence Factor = Subscore B

100 x 0.90 = 90

C. Apply physical state multiplier
Subscore B x Physical State Multiplier = Waste Characteristics Subscore

90 x 1.00 = 90

III. PATHWAYS

A. If there is evidence of migration of hazardous contaminants, assign maximum factor subscore of 100 points for direct evidence or 80 points for indirect evidence. If direct evidence exists then proceed to C. If no evidence or indirect evidence exists, proceed to B.

Subscore 0

B. Rate the migration potential for 3 potential pathways: surface water migration, flooding, and ground-water migration. Select the highest rating and proceed to C.

Rating Factor	Factor Rating (0-3)	Multi-plier	Factor Score	Maximum Possible Score
1. Surface Water Migration				
Distance to nearest surface water	3	8	24	24
Net precipitation	1	6	6	18
Surface erosion	1	8	8	24
Surface permeability	3	6	18	18
Rainfall intensity	2	8	16	24
Subtotals			72	108
Subscore (100 x factor score subtotal/maximum score subtotal)				67
2. Flooding	1	1	1	3
Subscore (100 x factor score/3)				33
3. Ground-water migration				
Depth to ground water	3	8	24	24
Net precipitation	1	6	6	18
Soil permeability	0	8	0	24
Subsurface flows	1	8	8	24
Direct access to ground water	1	8	8	24
Subtotals			46	114
Subscore (100 x factor score subtotal/maximum score subtotal)				40

C. Highest pathway subscore.

Enter the highest subscore value from A, B-1, B-2 or B-3 above.

Pathways Subscore 67

IV. WASTE MANAGEMENT PRACTICES

A. Average the three subscores for receptors, waste characteristics, and pathways.

Receptors		57
Waste Characteristics		90
Pathways		67
Total	214	divided by 3 = 71 Gross total score

B. Apply factor for waste containment from waste management practices.

Gross total score x waste management practices factor = final score

71 x 0.95 = 68

HAZARD ASSESSMENT RATING METHODOLOGY FORM

Name of Site: JP-4 TANK DIKE
Location: WEST POL AREA
Date of Operation or Occurrence: JANUARY 1972
Owner/Operator: OHARE ARFF
Comments/Description: SPILL IN DIKE; 42,000 GALLONS NOT RECOVERED

Site Rated by: GREGORY, McLEOD & REIMER

I. RECEPTORS

Rating Factor	Factor Rating (0-3)	Multi-plier	Factor Score	Maximum Possible Score
A. Population within 1,000 feet of site	3	4	12	12
B. Distance to nearest well	1	10	10	30
C. Land use/zoning within 1 mile radius	3	3	9	9
D. Distance to reservation boundry	3	6	18	18
E. Critical environments within 1 mile radius of site	3	10	30	30
F. Water quality of nearest surface water body	1	6	6	18
G. Ground water use of uppermost aquifer	0	9	0	27
H. Population served by surface water supply within 3 miles downstream of site	0	6	0	18
I. Population served by ground-water supply within 3 miles of site	3	6	18	18
Subtotals			103	180

Receptors subscore (100 x factor score subtotal/maximum score subtotal) 57

II. WASTE CHARACTERISTICS

A. Select the factor score based on the estimated quantity, the degree of hazard, and the confidence level of the information.

1. Waste quantity (1=small, 2=medium, 3=large) 3
2. Confidence level (1=confirmed, 2=suspected) 1
3. Hazard rating (1=low, 2=medium, 3=high) 3

Factor Subscore A (from 20 to 100 based on factor score matrix) 100

B. Apply persistence factor
Factor Subscore A x Persistence Factor = Subscore B

100 x 0.80 = 80

C. Apply physical state multiplier
Subscore B x Physical State Multiplier = Waste Characteristics Subscore

80 x 1.00 = 80

III. PATHWAYS

A. If there is evidence of migration of hazardous contaminants, assign maximum factor subscore of 100 points for direct evidence or 80 points for indirect evidence. If direct evidence exists then proceed to C. If no evidence or indirect evidence exists, proceed to B.

Subscore 0

B. Rate the migration potential for 3 potential pathways: surface water migration, flooding, and ground-water migration. Select the highest rating and proceed to C.

Rating Factor	Factor Rating (0-3)	Multi-plier	Factor Score	Maximum Possible Score
1. Surface Water Migration				
Distance to nearest surface water	3	8	24	24
Net precipitation	1	6	6	18
Surface erosion	1	8	8	24
Surface permeability	3	6	18	18
Rainfall intensity	2	8	16	24
Subtotals			72	108
Subscore (100 x factor score subtotal/maximum score subtotal)				67
2. Flooding	0	1	0	3
Subscore (100 x factor score/3)				0
3. Ground-water migration				
Depth to ground water	3	8	24	24
Net precipitation	1	6	6	18
Soil permeability	0	8	0	24
Subsurface flows	0	8	0	24
Direct access to ground water	1	8	8	24
Subtotals			38	114
Subscore (100 x factor score subtotal/maximum score subtotal)				33

C. Highest pathway subscore.
Enter the highest subscore value from A, B-1, B-2 or B-3 above.

Pathways Subscore 67

IV. WASTE MANAGEMENT PRACTICES

A. Average the three subscores for receptors, waste characteristics, and pathways.

Receptors		57
Waste Characteristics		80
Pathways		67
Total	204 divided by 3 =	68 Gross total score

B. Apply factor for waste containment from waste management practices.
Gross total score x waste management practices factor = final score

68 x 0.95 = 65

HAZARD ASSESSMENT RATING METHODOLOGY FORM

Name of Site: FUEL-CONTAMINATED SOIL
Location: BENEATH MAIN PARKING APRON
Date of Operation or Occurrence: 1979
Owner/Operator: OHARE ARFF
Comments/Description: SOIL 3 TO 4 FEET BELOW THE SURFACE WAS FOUND TO CONTAIN JP-4

Site Rated by: GREGORY, McLEOD & REIMER

I. RECEPTORS

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
A. Population within 1,000 feet of site	3	4	12	[illegible]
B. Distance to nearest well	1	10	[illegible]	30
C. Land use/zoning within 1 mile radius	3	3	[illegible]	[illegible]
D. Distance to reservation boundary	3	6	18	18
E. Critical environments within 1 mile radius of site	3	10	30	[illegible]
F. Water quality of nearest surface water body	1	6	[illegible]	18
G. Ground water use of uppermost aquifer	0	[illegible]	[illegible]	[illegible]
H. Population served by surface water supply within 3 miles downstream of site	[illegible]	6	[illegible]	[illegible]
I. Population served by ground-water supply within 3 miles of site	3	6	18	18
Subtotals			102	180

Receptors subscore (100 x factor score subtotal/maximum score subtotal) 57

II. WASTE CHARACTERISTICS

A. Select the factor score based on the estimated quantity, the degree of hazard, and the confidence level of the information.

1. Waste quantity (1=small, 2=medium, 3=large) 1
2. Confidence level (1=confirmed, 2=suspected) 1
3. Hazard rating (1=low, 2=medium, 3=high) 3

Factor Subscore A (from 20 to 100 based on factor score matrix) 60

B. Apply persistence factor
Factor Subscore A x Persistence Factor = Subscore B

60 x 0.90 = 54

C. Apply physical state multiplier
Subscore B x Physical State Multiplier = Waste Characteristics Subscore

54 x 1.00 = 54

III. PATHWAYS

A. If there is evidence of migration of hazardous contaminants, assign maximum factor subscore of 100 points for direct evidence or 80 points for indirect evidence. If direct evidence exists then proceed to C. If no evidence or indirect evidence exists, proceed to B.

Subscore 80

B. Rate the migration potential for 3 potential pathways: surface water migration, flooding, and ground-water migration. Select the highest rating and proceed to C.

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
1. Surface water Migration				
Distance to nearest surface water	3	8	24	24
Net precipitation	1	6	6	18
Surface erosion	1	8	[illegible]	24
Surface permeability	3	[illegible]	[illegible]	18
Rainfall intensity	2	8	16	24
Subtotals			[illegible]	108
Subscore (100 x factor score subtotal/maximum score subtotal)				67
2. Flooding	1	1	1	3
Subscore (100 x factor score/3)				33
3. Ground-water migration				
Depth to ground water	3	8	24	24
Net precipitation	1	6	6	18
Soil permeability	0	8	0	24
Subsurface flows	1	8	8	24
Direct access to ground water	2	8	16	24
Subtotals			54	114
Subscore (100 x factor score subtotal/maximum score subtotal)				47

C. Highest pathway subscore.

Enter the highest subscore value from A, B-1, B-2 or B-3 above.

Pathways Subscore 80

IV. WASTE MANAGEMENT PRACTICES

A. Average the three subscores for receptors, waste characteristics, and pathways.

Receptors	57
Waste Characteristics	54
Pathways	80
Total 191 divided by 3 =	64 Gross total score

B. Apply factor for waste containment from waste management practices.

Gross total score x waste management practices factor = final score

64 x 1.00 = 64

HAZARD ASSESSMENT RATING METHODOLOGY FORM

Name of Site: DEFUELING PIT LEAK SITE
Location: WEST PERIMETER OF BASE
Date of Operation or Occurrence: LATE 1960'S
Owner/Operator: OHARE ARFF
Comments/Description:

Site Rated by: GREGORY,McLEOD & REIMER

I. RECEPTORS

Rating Factor	Factor Rating (0-3)	Multi-plier	Factor Score	Maximum Possible Score
A. Population within 1,000 feet of site	3	4	12	12
B. Distance to nearest well	1	10	10	30
C. Land use/zoning within 1 mile radius	3	3	9	9
D. Distance to reservation boundry	3	6	18	18
E. Critical environments within 1 mile radius of site	3	10	30	30
F. Water quality of nearest surface water body	1	6	6	18
G. Ground water use of uppermost aquifer	0	9	0	27
H. Population served by surface water supply within 3 miles downstream of site	0	6	0	18
I. Population served by ground-water supply within 3 miles of site	3	6	18	18
Subtotals			103	180

Receptors subscore (100 x factor score subtotal/maximum score subtotal) 57

II. WASTE CHARACTERISTICS

A. Select the factor score based on the estimated quantity, the degree of hazard, and the confidence level of the information.

1. Waste quantity (1=small, 2=medium, 3=large) 2
2. Confidence level (1=confirmed, 2=suspected) 1
3. Hazard rating (1=low, 2=medium, 3=high) 3

Factor Subscore A (from 20 to 100 based on factor score matrix) 80

B. Apply persistence factor
Factor Subscore A x Persistence Factor = Subscore B

80 x 0.80 = 64

C. Apply physical state multiplier
Subscore B x Physical State Multiplier = Waste Characteristics Subscore

64 x 1.00 = 64

III. PATHWAYS

A. If there is evidence of migration of hazardous contaminants, assign maximum factor subscore of 100 points for direct evidence or 80 points for indirect evidence. If direct evidence exists then proceed to C. If no evidence or indirect evidence exists, proceed to B.

Subscore 0

B. Rate the migration potential for 3 potential pathways: surface water migration, flooding, and ground-water migration. Select the highest rating and proceed to C.

Rating Factor	Factor Rating (0-3)	Multi-plier	Factor Score	Maximum Possible Score
1. Surface Water Migration				
Distance to nearest surface water	3	8	24	24
Net precipitation	1	6	6	18
Surface erosion	1	8	8	24
Surface permeability	3	6	18	18
Rainfall intensity	2	8	16	24
Subtotals			72	108
Subscore (100 x factor score subtotal/maximum score subtotal)				67
2. Flooding	0	1	0	3
Subscore (100 x factor score/3)				0
3. Ground-water migration				
Depth to ground water	3	8	24	24
Net precipitation	1	6	6	18
Soil permeability	0	8	0	24
Subsurface flows	0	8	0	24
Direct access to ground water	1	8	8	24
Subtotals			38	114
Subscore (100 x factor score subtotal/maximum score subtotal)				33

C. Highest pathway subscore.

Enter the highest subscore value from A, B-1, B-2 or B-3 above.

Pathways Subscore 67

IV. WASTE MANAGEMENT PRACTICES

A. Average the three subscores for receptors, waste characteristics, and pathways.

Receptors		57
Waste Characteristics		64
Pathways		67
Total	188 divided by 3 =	63 Gross total score

B. Apply factor for waste containment from waste management practices.

Gross total score x waste management practices factor = final score

63 x 1.00 = 63

HAZARD ASSESSMENT RATING METHODOLOGY FORM

Name of Site: FIRE PROTECTION TRAINING AREA
Location: SOUTHEAST OF HARPER DR. AND OLD MANNHEIM RD.
Date of Operation or Occurrence: 1955 TO EARLY 1960'S
Owner/Operator: OHARE ARFF
Comments/Description:

Site Rated by: GREGORY, McLEOD & REIMER

I. RECEPTORS

Rating Factor	Factor Rating (0-3)	Multi-plier	Factor Score	Maximum Possible Score
A. Population within 1,000 feet of site	3	4	12	12
B. Distance to nearest well	1	10	10	30
C. Land use/zoning within 1 mile radius	3	3	9	9
D. Distance to reservation boundry	3	6	18	18
E. Critical environments within 1 mile radius of site	3	10	30	30
F. Water quality of nearest surface water body	1	6	6	18
G. Ground water use of uppermost aquifer	0	9	0	27
H. Population served by surface water supply within 3 miles downstream of site	0	6	0	18
I. Population served by ground-water supply within 3 miles of site	3	6	18	18
Subtotals			103	180

Receptors subscore (100 x factor score subtotal/maximum score subtotal) 57

II. WASTE CHARACTERISTICS

A. Select the factor score based on the estimated quantity, the degree of hazard, and the confidence level of the information.

1. Waste quantity (1=small, 2=medium, 3=large) 2
2. Confidence level (1=confirmed, 2=suspected) 1
3. Hazard rating (1=low, 2=medium, 3=high) 3

Factor Subscore A (from 20 to 100 based on factor score matrix) 80

B. Apply persistence factor
Factor Subscore A x Persistence Factor = Subscore B

80 x 0.80 = 64

C. Apply physical state multiplier
Subscore B x Physical State Multiplier = Waste Characteristics Subscore

64 x 1.00 = 64

III. PATHWAYS

A. If there is evidence of migration of hazardous contaminants, assign maximum factor subscore of 100 points for direct evidence or 80 points for indirect evidence. If direct evidence exists then proceed to C. If no evidence or indirect evidence exists, proceed to B.

Subscore 0

B. Rate the migration potential for 3 potential pathways: surface water migration, flooding, and ground-water migration. Select the highest rating and proceed to C.

Rating Factor	Factor Rating (0-3)	Multi-plier	Factor Score	Maximum Possible Score
1. Surface Water Migration				
Distance to nearest surface water	3	8	24	24
Net precipitation	1	6	6	18
Surface erosion	1	8	8	24
Surface permeability	3	6	18	18
Rainfall intensity	2	8	16	24
Subtotals			72	108
Subscore (100 x factor score subtotal/maximum score subtotal)				67
2. Flooding	0	1	0	3
Subscore (100 x factor score/3)				0
3. Ground-water migration				
Depth to ground water	3	8	24	24
Net precipitation	1	6	6	18
Soil permeability	0	8	0	24
Subsurface flows	0	8	0	24
Direct access to ground water	1	8	8	24
Subtotals			38	114
Subscore (100 x factor score subtotal/maximum score subtotal)				33

C. Highest pathway subscore.

Enter the highest subscore value from A, B-1, B-2 or B-3 above.

Pathways Subscore 67

IV. WASTE MANAGEMENT PRACTICES

A. Average the three subscores for receptors, waste characteristics, and pathways.

Receptors		57	
Waste Characteristics		64	
Pathways		67	
Total	188 divided by 3 =		63 Gross total score

B. Apply factor for waste containment from waste management practices.

Gross total score x waste management practices factor = final score

63 x 0.95 = \ 60 \

HAZARD ASSESSMENT RATING METHODOLOGY FORM

Name of Site: HAZARDOUS WASTE STORAGE AREA
Location: SOUTHERNMOST EDGE OF OLD ASSEMBLY PLANT FOUNDATION
Date of Operation or Occurrence: PRESENT
Owner/Operator: OHARE ARFF
Comments/Description: DRUMS IN DEPRESSED EARTH AREA

Site Rated by: GREGORY, McLEOD & REIMER

I. RECEPTORS

Rating Factor	Factor Rating (0-3)	Multi-plier	Factor Score	Maximum Possible Score
A. Population within 1,000 feet of site	3	4	12	12
B. Distance to nearest well	1	10	10	30
C. Land use/zoning within 1 mile radius	3	3	9	9
D. Distance to reservation boundry	3	6	18	18
E. Critical environments within 1 mile radius of site	3	10	30	30
F. Water quality of nearest surface water body	1	6	6	18
G. Ground water use of uppermost aquifer	0	9	0	27
H. Population served by surface water supply within 3 miles downstream of site	0	6	0	18
I. Population served by ground-water supply within 3 miles of site	3	6	18	18
Subtotals			103	180

Receptors subscore (100 x factor score subtotal/maximum score subtotal) 57

II. WASTE CHARACTERISTICS

A. Select the factor score based on the estimated quantity, the degree of hazard, and the confidence level of the information.

1. Waste quantity (1=small, 2=medium, 3=large) 1
2. Confidence level (1=confirmed, 2=suspected) 1
3. Hazard rating (1=low, 2=medium, 3=high) 3

Factor Subscore A (from 20 to 100 based on factor score matrix) 60

B. Apply persistence factor
Factor Subscore A x Persistence Factor = Subscore B

60 x 1.00 = 60

C. Apply physical state multiplier
Subscore B x Physical State Multiplier = Waste Characteristics Subscore

60 x 1.00 = 60

III. PATHWAYS

A. If there is evidence of migration of hazardous contaminants, assign maximum factor subscore of 100 points for direct evidence or 80 points for indirect evidence. If direct evidence exists then proceed to C. If no evidence or indirect evidence exists, proceed to B.

Subscore 0

B. Rate the migration potential for 3 potential pathways: surface water migration, flooding, and ground-water migration. Select the highest rating and proceed to C.

Rating Factor	Factor Rating (0-3)	Multi-plier	Factor Score	Maximum Possible Score
1. Surface Water Migration				
Distance to nearest surface water	3	8	24	24
Net precipitation	1	6	6	18
Surface erosion	1	8	8	24
Surface permeability	3	6	18	18
Rainfall intensity	2	8	16	24
Subtotals			72	108
Subscore (100 x factor score subtotal/maximum score subtotal)				67
2. Flooding	0	1	0	3
Subscore (100 x factor score/3)				0
3. Ground-water migration				
Depth to ground water	3	8	24	24
Net precipitation	1	6	6	18
Soil permeability	0	8	0	24
Subsurface flows	0	8	0	24
Direct access to ground water	1	8	8	24
Subtotals			38	114
Subscore (100 x factor score subtotal/maximum score subtotal)				33

C. Highest pathway subscore.

Enter the highest subscore value from A, B-1, B-2 or B-3 above.

Pathways Subscore 67

IV. WASTE MANAGEMENT PRACTICES

A. Average the three subscores for receptors, waste characteristics, and pathways.

Receptors	57	
Waste Characteristics	60	
Pathways	67	
Total 184 divided by 3 =		61 Gross total score

B. Apply factor for waste containment from waste management practices.

Gross total score x waste management practices factor = final score

61 x 0.95 = 58

HAZARD ASSESSMENT RATING METHODOLOGY FORM

Name of Site: LANDFILL NO. 2
Location: SOUTHEAST AREA OF BASE
Date of Operation or Occurrence: 1965 TO EARLY 1970'S
Owner/Operator: OHARE ARFF
Comments/Description: TRENCH AND FILL TYPE

Site Rated by: GREGORY, McLEOD & REIMER

I. RECEPTORS

Rating Factor	Factor Rating (0-3)	Multi-plier	Factor Score	Maximum Possible Score
A. Population within 1,000 feet of site	3	4	12	12
B. Distance to nearest well	1	10	10	30
C. Land use/zoning within 1 mile radius	3	3	9	9
D. Distance to reservation boundry	3	6	18	18
E. Critical environments within 1 mile radius of site	3	10	30	30
F. Water quality of nearest surface water body	1	6	6	18
G. Ground water use of uppermost aquifer	0	9	0	27
H. Population served by surface water supply within 3 miles downstream of site	0	6	0	18
I. Population served by ground-water supply within 3 miles of site	3	6	18	18
Subtotals			103	180

Receptors subscore (100 x factor score subtotal/maximum score subtotal) 57

II. WASTE CHARACTERISTICS

A. Select the factor score based on the estimated quantity, the degree of hazard, and the confidence level of the information.

1. Waste quantity (1=small, 2=medium, 3=large) 2
2. Confidence level (1=confirmed, 2=suspected) 2
3. Hazard rating (1=low, 2=medium, 3=high) 3

Factor Subscore A (from 20 to 100 based on factor score matrix) 50

B. Apply persistence factor
Factor Subscore A x Persistence Factor = Subscore B

50 x 1.00 = 50

C. Apply physical state multiplier
Subscore B x Physical State Multiplier = Waste Characteristics Subscore

50 x 1.00 = 50

III. PATHWAYS

A. If there is evidence of migration of hazardous contaminants, assign maximum factor subscore of 100 points for direct evidence or 80 points for indirect evidence. If direct evidence exists then proceed to C. If no evidence or indirect evidence exists, proceed to B.

Subscore 0

B. Rate the migration potential for 3 potential pathways: surface water migration, flooding, and ground-water migration. Select the highest rating and proceed to C.

Rating Factor	Factor Rating (0-3)	Multi-plier	Factor Score	Maximum Possible Score
1. Surface Water Migration				
Distance to nearest surface water	3	8	24	24
Net precipitation	1	6	6	18
Surface erosion	1	8	8	24
Surface permeability	3	6	18	18
Rainfall intensity	2	8	16	24
Subtotals			72	108
Subscore (100 x factor score subtotal/maximum score subtotal)				67
2. Flooding	0	1	0	3
Subscore (100 x factor score/3)				0
3. Ground-water migration				
Depth to ground water	3	8	24	24
Net precipitation	1	6	6	18
Soil permeability	0	8	0	24
Subsurface flows	1	8	8	24
Direct access to ground water	1	8	8	24
Subtotals			46	114
Subscore (100 x factor score subtotal/maximum score subtotal)				40

C. Highest pathway subscore.

Enter the highest subscore value from A, B-1, B-2 or B-3 above.

Pathways Subscore 67

IV. WASTE MANAGEMENT PRACTICES

A. Average the three subscores for receptors, waste characteristics, and pathways.

Receptors		57	
Waste Characteristics		50	
Pathways		67	
Total	174 divided by 3 =		58 Gross total score

B. Apply factor for waste containment from waste management practices.

Gross total score x waste management practices factor = final score

58 x 0.95 = 55

[illegible]

[illegible] INAGE [illegible] AIR[illegible] HANG[illegible]
[illegible]
[illegible] ENCE. [illegible]PRESIDENT
[illegible]
[illegible] SYSTEM [illegible] WOOD AND CONCRETE PI[illegible]

GREGORY, McLEOD & REIMER

[illegible]

Rating Factor	Factor Rating (0-3)	Multi-plier	Factor Score	Maximum Possible Score
A. Population within 1,000 feet of site	3	4	12	12
B. Distance to nearest well	[illegible]	10	[illegible]	30
C. Land use/zoning within 1 mile radius	3	3	9	[illegible]
D. Distance to reservation boundary	[illegible]	[illegible]	[illegible]	[illegible]
E. Critical environments within 1 mile radius of site	[illegible]	[illegible]	30	[illegible]
F. Water quality of nearest surface water body		6		[illegible]
G. Ground water use of uppermost aquifer	[illegible]	9	[illegible]	[illegible]
H. Population served by surface water supply within 3 miles downstream of site	0	6	0	18
I. Population served by ground-water supply within 3 miles of site	3	6	18	[illegible]
Subtotals			10[illegible]	180

Receptors subscore (100 x factor score subtotal/maximum score subtotal) 57

II. WASTE CHARACTERISTICS

A. Select the factor score based on the estimated quantity, the degree of hazard, and the confidence level of the information.

1. Waste quantity (1=small, 2=medium, 3=large) 1
2. Confidence level (1=confirmed, 2=suspected) 2
3. Hazard rating (1=low, 2=medium, 3=high) [illegible]

Factor Subscore A (from 20 to 100 based on factor score matrix) 40

B. Apply persistence factor
Factor Subscore A x Persistence Factor = Subscore B

40 x 0.90 = 36

C. Apply physical state multiplier
Subscore B x Physical State Multiplier = Waste Characteristics Subscore

36 x 1.00 = 36

III. PATHWAYS

A. If there is evidence of migration of hazardous contaminants, assign maximum factor subscore of 100 points for direct evidence or 80 points for indirect evidence. If direct evidence exists then proceed to C. If no evidence or indirect evidence exists, proceed to B.

Subscore 0

B. Rate the migration potential for 3 potential pathways: surface water migration, flooding, and ground-water migration. Select the highest rating, and proceed to C.

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
1. Surface Water Migration				
Distance to nearest surface water	3	8	24	24
Net precipitation	1	6	6	18
Surface erosion	1	8	8	24
Surface permeability	3	6	18	18
Rainfall intensity	2	8	16	24
Subtotals			72	108
Subscore (100 x factor score subtotal/maximum score subtotal)				67
2. Flooding	2	1	2	3
Subscore (100 x factor score/3)				67
3. Ground-water migration				
Depth to ground water	3	8	24	24
Net precipitation	1	6	6	18
Soil permeability	0	8	0	24
Subsurface flows	2	8	16	24
Direct access to ground water	3	8	24	24
Subtotals			70	114
Subscore (100 x factor score subtotal/maximum score subtotal)				61

C. Highest pathway subscore.

Enter the highest subscore value from A, B-1, B-2 or B-3 above.

Pathways Subscore 67

IV. WASTE MANAGEMENT PRACTICES

A. Average the three subscores for receptors, waste characteristics, and pathways.

Receptors	57
Waste Characteristics	36
Pathways	67
Total 160 divided by 3 =	53 Gross total score

B. Apply factor for waste containment from waste management practices.

Gross total score x waste management practices factor = final score

53 x 1.00 = 53

HAZARD ASSESSMENT RATING METHODOLOGY FORM

Name of Site: SOUTH EDGE OF APRON
Location: SOUTHERN PERIMETER OF BASE
Date of Operation or Occurrence: PRIOR TO 1970
Owner/Operator: OHARE ARFF
Comments/Description: DISPOSAL OF SMALL QUANTITIES OF SHOPWASTES ONTO EARTH

Site Rated by: GREGORY, McLEOD & REIMER

I. RECEPTORS

Rating Factor	Factor Rating (0-3)	Multi-plier	Factor Score	Maximum Possible Score
A. Population within 1,000 feet of site	3	4	12	12
B. Distance to nearest well	1	10	10	30
C. Land use/zoning within 1 mile radius	3	3	9	9
D. Distance to reservation boundry	3	6	18	18
E. Critical environments within 1 mile radius of site	3	10	30	30
F. Water quality of nearest surface water body	1	6	6	18
G. Ground water use of uppermost aquifer	0	9	0	27
H. Population served by surface water supply within 3 miles downstream of site	0	6	0	18
I. Population served by ground-water supply within 3 miles of site	3	6	18	18
Subtotals			103	180

Receptors subscore (100 x factor score subtotal/maximum score subtotal) 57

II. WASTE CHARACTERISTICS

A. Select the factor score based on the estimated quantity, the degree of hazard, and the confidence level of the information.

1. Waste quantity (1=small, 2=medium, 3=large) 1
2. Confidence level (1=confirmed, 2=suspected) 2
3. Hazard rating (1=low, 2=medium, 3=high) 3

Factor Subscore A (from 20 to 100 based on factor score matrix) 40

B. Apply persistence factor
Factor Subscore A x Persistence Factor = Subscore B

40 x 0.80 = 32

C. Apply physical state multiplier
Subscore B x Physical State Multiplier = Waste Characteristics Subscore

32 x 1.00 = 32

III. PATHWAYS

A. If there is evidence of migration of hazardous contaminants, assign maximum factor subscore of 100 points for direct evidence or 80 points for indirect evidence. If direct evidence exists then proceed to C. If no evidence or indirect evidence exists, proceed to B.

Subscore 0

B. Rate the migration potential for 3 potential pathways: surface water migration, flooding, and ground-water migration. Select the highest rating and proceed to C.

Rating Factor	Factor Rating (0-3)	Multi-plier	Factor Score	Maximum Possible Score
1. Surface Water Migration				
Distance to nearest surface water	3	8	24	24
Net precipitation	1	6	6	18
Surface erosion	1	8	8	24
Surface permeability	3	6	18	18
Rainfall intensity	2	8	16	24
Subtotals			72	108
Subscore (100 x factor score subtotal/maximum score subtotal)				67
2. Flooding	0	1	0	3
Subscore (100 x factor score/3)				0
3. Ground-water migration				
Depth to ground water	3	8	24	24
Net precipitation	1	6	6	18
Soil permeability	0	8	0	24
Subsurface flows	0	8	0	24
Direct access to ground water	1	8	8	24
Subtotals			38	114
Subscore (100 x factor score subtotal/maximum score subtotal)				33

C. Highest pathway subscore.

Enter the highest subscore value from A, B-1, B-2 or B-3 above.

Pathways Subscore 67

IV. WASTE MANAGEMENT PRACTICES

A. Average the three subscores for receptors, waste characteristics, and pathways.

Receptors	57
Waste Characteristics	32
Pathways	67
Total	156 divided by 3 = 52 Gross total score

B. Apply factor for waste containment from waste management practices.

Gross total score x waste management practices factor = final score

52 x 1.00 = \ 52 \

HAZARD ASSESSMENT RATING METHODOLOGY FORM

Name of Site: VEHICLE MAINTENANCE FACILITY
Location: BLDG. 5,REAR
Date of Operation or Occurrence: PRIOR TO 1977
Owner/Operator: OHARE ARFF
Comments/Description: WASTE OIL DISPOSED OF ONTO GROUND

Site Rated by: GREGORY,McLEOD & REIMER

I. RECEPTORS

Rating Factor	Factor Rating (0-3)	Multi-plier	Factor Score	Maximum Possible Score
A. Population within 1,000 feet of site	3	4	12	12
B. Distance to nearest well	1	10	10	30
C. Land use/zoning within 1 mile radius	3	3	9	9
D. Distance to reservation boundry	3	6	18	18
E. Critical environments within 1 mile radius of site	3	10	30	30
F. Water quality of nearest surface water body	1	6	6	18
G. Ground water use of uppermost aquifer	0	9	0	27
H. Population served by surface water supply within 3 miles downstream of site	0	6	0	18
I. Population served by ground-water supply within 3 miles of site	3	6	18	18
Subtotals			103	180

Receptors subscore (100 x factor score subtotal/maximum score subtotal) 57

II. WASTE CHARACTERISTICS

A. Select the factor score based on the estimated quantity, the degree of hazard, and the confidence level of the information.

1. Waste quantity (1=small, 2=medium, 3=large) 1
2. Confidence level (1=confirmed, 2=suspected) 1
3. Hazard rating (1=low, 2=medium, 3=high) 1

Factor Subscore A (from 20 to 100 based on factor score matrix) 30

B. Apply persistence factor
Factor Subscore A x Persistence Factor = Subscore B

30 x 0.80 = 24

C. Apply physical state multiplier
Subscore B x Physical State Multiplier = Waste Characteristics Subscore

24 x 1.00 = 24

III. PATHWAYS

A. If there is evidence of migration of hazardous contaminants, assign maximum factor subscore of 100 points for direct evidence or 80 points for indirect evidence. If direct evidence exists then proceed to C. If no evidence or indirect evidence exists, proceed to B.

Subscore 0

B. Rate the migration potential for 3 potential pathways: surface water migration, flooding, and ground-water migration. Select the highest rating and proceed to C.

Rating Factor	Factor Rating (0-3)	Multi-plier	Factor Score	Maximum Possible Score
1. Surface Water Migration				
Distance to nearest surface water	3	8	24	24
Net precipitation	1	6	6	18
Surface erosion	1	8	8	24
Surface permeability	3	6	18	18
Rainfall intensity	2	8	16	24
Subtotals			72	108
Subscore (100 x factor score subtotal/maximum score subtotal)				67
2. Flooding	0	1	0	3
Subscore (100 x factor score/3)				0
3. Ground-water migration				
Depth to ground water	3	8	24	24
Net precipitation	1	6	6	18
Soil permeability	0	8	0	24
Subsurface flows	0	8	0	24
Direct access to ground water	1	8	8	24
Subtotals			38	114
Subscore (100 x factor score subtotal/maximum score subtotal)				33

C. Highest pathway subscore.
Enter the highest subscore value from A, B-1, B-2 or B-3 above.

Pathways Subscore 67

IV. WASTE MANAGEMENT PRACTICES

A. Average the three subscores for receptors, waste characteristics, and pathways.

Receptors		57	
Waste Characteristics		24	
Pathways		67	
Total	148 divided by 3 =		49 Gross total score

B. Apply factor for waste containment from waste management practices.
Gross total score x waste management practices factor = final score

49 x 1.00 = 49

HAZARD ASSESSMENT RATING METHODOLOGY FORM

Name of Site: LOW LEVEL RADIOACTIVE DISPOSAL SITE
Location: IMMEDIATELY EAST OF SOUTH POL AREA
Date of Operation or Occurrence: PRIOR TO 1970
Owner/Operator: OHARE ARFF
Comments/Description: VACUUM TUBE DISPOSED OF INTO EARTH

Site Rated by: GREGORY, McLEOD & REIMER

I. RECEPTORS

Rating Factor	Factor Rating (0-3)	Multi-plier	Factor Score	Maximum Possible Score
A. Population within 1,000 feet of site	3	4	12	12
B. Distance to nearest well	1	10	10	30
C. Land use/zoning within 1 mile radius	3	3	9	9
D. Distance to reservation boundry	3	6	18	18
E. Critical environments within 1 mile radius of site	3	10	30	30
F. Water quality of nearest surface water body	1	6	6	18
G. Ground water use of uppermost aquifer	0	9	0	27
H. Population served by surface water supply within 3 miles downstream of site	0	6	0	18
I. Population served by ground-water supply within 3 miles of site	3	6	18	18
Subtotals			103	180

Receptors subscore (100 x factor score subtotal/maximum score subtotal) 57

II. WASTE CHARACTERISTICS

A. Select the factor score based on the estimated quantity, the degree of hazard, and the confidence level of the information.

1. Waste quantity (1=small, 2=medium, 3=large) 1
2. Confidence level (1=confirmed, 2=suspected) 1
3. Hazard rating (1=low, 2=medium, 3=high) 1

Factor Subscore A (from 20 to 100 based on factor score matrix) 30

B. Apply persistence factor
Factor Subscore A x Persistence Factor = Subscore B

30 x 1.00 = 30

C. Apply physical state multiplier
Subscore B x Physical State Multiplier = Waste Characteristics Subscore

30 x 0.50 = 15

III. PATHWAYS

A. If there is evidence of migration of hazardous contaminants, assign maximum factor subscore of 100 points for direct evidence or 80 points for indirect evidence. If direct evidence exists then proceed to C. If no evidence or indirect evidence exists, proceed to B.

Subscore 0

B. Rate the migration potential for 3 potential pathways: surface water migration, flooding, and ground-water migration. Select the highest rating and proceed to C.

Rating Factor	Factor Rating (0-3)	Multi-plier	Factor Score	Maximum Possible Score
1. Surface Water Migration				
Distance to nearest surface water	3	8	24	24
Net precipitation	1	6	6	18
Surface erosion	1	8	8	24
Surface permeability	3	6	18	18
Rainfall intensity	2	8	16	24
Subtotals			72	108
Subscore (100 x factor score subtotal/maximum score subtotal)				67
2. Flooding	0	1	0	3
Subscore (100 x factor score/3)				0
3. Ground-water migration				
Depth to ground water	3	8	24	24
Net precipitation	1	6	6	18
Soil permeability	0	8	0	24
Subsurface flows	0	8	0	24
Direct access to ground water	1	8	8	24
Subtotals			38	114
Subscore (100 x factor score subtotal/maximum score subtotal)				33

C. Highest pathway subscore.
Enter the highest subscore value from A, B-1, B-2 or B-3 above.

Pathways Subscore 67

IV. WASTE MANAGEMENT PRACTICES

A. Average the three subscores for receptors, waste characteristics, and pathways.

Receptors		57
Waste Characteristics		15
Pathways		67
Total	139 divided by 3 =	46 Gross total score

B. Apply factor for waste containment from waste management practices.
Gross total score x waste management practices factor = final score

46 x 0.95 = \ 44 \

APPENDIX I

REFERENCES

APPENDIX I
REFERENCES

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APPENDIX J
GLOSSARY OF TERMINOLOGY AND ABBREVIATIONS

APPENDIX J

GLOSSARY OF TERMINOLOGY AND ABBREVIATIONS

AF: Air Force

AFFF: Aqueous Film Forming Foam

AFB: Air Force Base

AFCS: Air Force Communications Service

AFESC: Air Force Engineering and Services Center

AFR: Air Force Regulation

AFSC: Air Force Systems Command

Ag: Chemical symbol for silver

AGE: Aerospace Ground Equipment

Al: Chemical symbol for aluminum

ALLUVIUM: Unconsolidated sediments deposited in relatively recent geologic time by the action of water

ARTESIAN: Ground water contained under hydrostatic pressure

AQUICLUDE: Poorly permeable formation that impedes ground-water movement and does not yield water to a well or spring

AQUIFER: A geologic formation, group of formations, or part of a formation that is capable of yielding water to a well or spring

AQUITARD: A soils formation which impedes ground-water flow

ARFF: Air Reserve Force Facility

AVGAS: Aviation Gasoline

Ba: Chemical symbol for barium

Bedrock: Any solid rock exposed at the surface of the earth or overlain by unconsolidated material.

BIOACCUMULATE: Tendency of elements or compounds to accumulate or build up in the tissues of living organisms when they are exposed to these elements in their environments, e.g., heavy metals

CAP: Civilian Air Patrol

Cd: Chemical symbol for cadmium

CE: Civil Engineering

CERCLA: Comprehensive Environmental Response, Compensation and Liability Act

CES: Civil Engineering Squadron

CLOSURE: The completion of a set of rigidly defined functions for a hazardous waste facility no longer in operation

COD: Chemical Oxygen Demand, a measure of the amount of oxygen required to oxidize organic and oxidizable inorganic compounds in water

COE: Corps of Engineers

COMD: Command

CONFINED AQUIFER: An aquifer bounded above and below by impermeable beds or by beds of distinctly lower permeability than that of the aquifer itself

CONTAMINATION: The degradation of natural water quality to the extent that its usefulness is impaired; there is no implication of any specific limits since the degree of permissible contamination depends upon the intended end use or uses of the water

Cr: Chemical symbol for chromium

Cu: Chemical symbol for copper

DET: Detachment

DIP: The angle at which a stratum is inclined from the horizontal

DISPOSAL FACILITY: A facility or part of a facility at which hazardous waste is intentionally placed into or on land or water, and at which waste will remain after closure

DISPOSAL OF HAZARDOUS WASTE: The discharge, deposit, injection, dumping, spilling, or placing of any hazardous waste into or on land or water so that such waste or any constituent thereof may enter the environment or be emitted into the air or discharged into any waters, including ground water

DOD: Department of Defense

DOWNGRADIENT: In the direction of decreasing hydraulic static head; the direction in which ground water flows

DPDO: Defense Property Disposal Office, previously included Redistribution and Marketing (R&M) and Salvage.

DUMP: An uncovered land disposal site where solid and/or liquid wastes are deposited with little or no regard for pollution control or aesthetics; dumps are susceptible to open burning and are exposed to the elements, disease vectors and scavengers

EOD: Explosive Ordnance Disposal

EFFLUENT: A liquid waste discharge from a manufacturing or treatment process, in its natural state, or partially or completely treated, that discharges into the environment

EP: Extraction Procedure, the EPA's standard laboratory procedure for leachate generation

EPA: U.S. Environmental Protection Agency

EROSION: The wearing away of land surface by wind or water

FAA: Federal Aviation Administration

FACILITY: Any land and appurtenances used for the treatment, storage and/or disposal of hazardous wastes

Fe: Chemical symbol for iron

FLOOD PLAIN: The lowland and relatively flat areas adjoining inland and coastal areas of the mainland and off-shore islands, including, at a minimum, areas subject to a one percent or greater chance of flooding in any given year

FLOW PATH: The direction or movement of ground water and any contaminants that may be contained therein, as governed principally by the hydraulic gradient

GC/MS: Gas chromatograph/mass spectrophotometer, a laboratory procedure for identifying unknown compounds

GROUND WATER: Water beneath the land surface that is under atmospheric or artesian pressure

GROUND WATER RESERVOIR: The earth materials and the intervening open spaces that contain ground water

HALF-LIFE: The time required for half the atoms present in radioactive substance to decay

HARDFILL: Disposal sites receiving construction debris, wood, miscellaneous spoil material

HARM: Hazard Assessment Rating Methodology

HAZARDOUS WASTE: A solid waste, or combination of solid wastes, which because of its quantity, concentration, or physical, chemical or infectious characteristics may cause or significantly contribute to an increase in mortality or an increase in serious, irreversible, or incapacitating reversible illness; or

pose a substantial present or potential hazard to human health or the environment when improperly treated, stored, transported, or disposed of, or otherwise managed (RCRA)

HAZARDOUS WASTE GENERATION: The act or process of producing a hazardous waste

HEAVY METALS: Metallic elements, including the transition series, which include many elements required for plant and animal nutrition in trace concentrations but which become toxic at higher concentrations

Hg: Chemical symbol for mercury

HQ: Headquarters

HWMF: Hazardous Waste Management Facility

INCOMPATIBLE WASTE: A waste unsuitable for commingling with another waste or material because the commingling might result in generation of extreme heat or pressure, explosion or violent reaction, fire, formation of substances which are shock sensitive, friction sensitive, or otherwise have the potential for reacting violently, formation of toxic dusts, mists, fumes, and gases, volatilization of ignitable or toxic chemicals due to heat generation in such a manner that the likelihood of contamination of ground water or escape of the substance into the environment is increased, any other reaction which might result in not meeting the air, human health, and environmental standard

INFILTRATION: The gradual passing of liquid through matter.

IRP: Installation Restoration Program

JP-4: Jet Fuel

LEACHATE: A solution resulting from the separation or dissolving of soluble or particulate constituents from solid waste or other man-placed medium by percolation of water

LEACHING: The process by which soluble materials in the soil, such as nutrients, pesticide chemicals or contaminants, are washed into a lower layer of soil or are dissolved and carried away by water

LINER: A continuous layer of natural or man-made materials beneath or on the sides of a surface impoundment, landfill, or landfill cell which restricts the downward or lateral escape of hazardous waste, hazardous waste constituents or leachate

LOESS: A sediment composed dominantly of silt-size particles that has been deposited primarily by the wind

LOX: Liquid Oxygen

LYSIMETERS: A vacuum operated sampling device used for extracting pore water samples at various depths within the unsaturated zone

MEK: Methyl Ethyl Ketone

MGD: million gallons per day

MOA: Military Operating Area

MOGAS: Motor gasoline

Mn: Chemical symbol for manganese

MONITORING WELL: A well used to measure ground-water levels and to obtain samples

MSL: Mean Sea Level

MUNITION ITEMS: Munitions or portions of munitions having an explosive potential

MUNITIONS RESIDUE: Non-explosive segments of waste munitions (i.e., bomb casings)

NCO: Non-commissioned Officer

NCOIC: Non-commissioned Officer In-Charge

NDI: Non-destructive Inspection

NET PRECIPITATION: The amount of annual precipitation minus annual evaporation

NGVD: National Geodetic Vertical Datum

Ni: Chemical symbol for nickel

NPDES: National Pollutant Discharge Elimination System

OEHL: Occupational and Environmental Health Laboratory

ORGANIC: Being, containing or relating to carbon compounds, especially in which hydrogen is attached to carbon

O&G: Symbols for oil and grease

OSI: Office of Special Investigations

OVA: Organic Vapor Analyzer

Pb: Chemical symbol for lead

PCB: Polychlorinated Biphenyls; highly toxic to aquatic life; they persist in the environment for long period and are biologically accumulative

PERCOLATION: Movement of moisture by gravity or hydrostatic pressure through interstices of unsaturated rock or soil

PERMEABILITY: The rate at which fluids may move through a solid, porous medium

PD-680: Cleaning solvent, safety solvent, Stoddard solvent, petroleum distillate

pH: Negative logarithm of hydrogen ion concentration; measurement of acids and bases

PL: Public Law

POL: Petroleum, Oils and Lubricants

POLLUTANT: Any introduced gas, liquid or solid that makes a resource unfit for a specific purpose

POTENTIALLY ACTIVE FAULT: A fault along which movement has occurred within the last 25-million years

PPM: Parts per million by weight

PRECIPITATION: Rainfall

RCRA: Resource Conservation and Recovery Act

RECHARGE AREA: An area in which water is absorbed that eventually reaches the zone of saturation in one or more aquifers

RECHARGE: The addition of water to the ground-water system by natural or artificial processes

RECON: Reconnaissance

SANITARY LANDFILL: A land disposal site using an engineered method of disposing solid wastes on land in a way that minimizes environmental hazards

SATURATED ZONE: That part of the earth's crust in which all voids are filled with water

SEISMICITY: Pertaining to earthquakes or earth vibrations

SLUDGE: The solid residue resulting from a manufacturing or wastewater treatment process which also produces a liquid stream

SOLID WASTE: Any garbage, refuse, or sludge from a waste treatment plant, water supply treatment, or air pollution control facility and other discarded material, including solid, liquid, semi-solid, or contained gaseous material resulting from industrial, commercial, mining, or agricultural operations and from community activities, but does not include solid or dissolved materials in domestic sewage; solid or dissolved materials in irrigation return flows; industrial discharges which are point source subject to permits under Section 402 of the Federal Water Pollution Control Act, as amended (86 USC 880); or source, special nuclear, or by-product material as defined by the Atomic Energy Act of 1954 (68 USC 923)

SPILL: Any unplanned release or discharge of a hazardous waste onto or into the air, land, or water

STORAGE OF HAZARDOUS WASTE: Containment, either on a temporary basis or for a longer period, in such a manner as not to constitute disposal of such hazardous waste

TAC: Tactical Air Command

TAG: Tactical Airlift Group

TCE: Tetrachloroethylene

TCA: 1,1,1-Tetrachloroethane

TOC: Total Organic Carbon

TOXICITY: The ability of a material to produce injury or disease upon exposure, ingestion, inhalation, or assimilation by a living organism

TRANSMISSIVITY: The rate at which water is transmitted through a unit width under a unit hydraulic gradient

TREATMENT OF HAZARDOUS WASTE: Any method, technique, or process including neutralization designed to change the physical, chemical, or biological character or composition of any hazardous waste so as to neutralize the waste or so as to render the waste nonhazardous

UPGRADIENT: In the direction of increasing hydraulic static head; the direction opposite to the prevailing flow of ground-water

USAF: United States Air Force

USGS: United States Geological Survey

WATER TABLE: Surface of a body of unconfined ground water at which the pressure is equal to that of the atmosphere

Zn: Chemical symbol for zinc

APPENDIX K

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APPENDIX K

INDEX

INSTALLATION RESTORATION PROGRAM
PHASE 1 - RECORDS SEARCH
O'HARE AIR RESERVE FORCES FACILITY, ILLINOIS

Prepared For

UNITED STATES AIR FORCE
HEADQUARTERS
AIR FORCE RESERVE
Robins Air Force Base, Georgia

December 1983

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NOTICE

This report has been prepared for the United States Air Force by Engineering-Science for the purpose of aiding in the Air Force Installation Restoration Program. It is not an endorsement of any product. The views expressed herein are those of the contractor and do not necessarily reflect the official views of the publishing agency, the United States Air Force, nor the Department of Defense.

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EXECUTIVE SUMMARY

The Department of Defense (DOD) has developed a program to identify and evaluate past hazardous material disposal sites on DOD property, to control the migration of hazardous contaminants, and to control hazards to health or welfare that may result from these past disposal operations. This program is called the Installation Restoration Program (IRP). The IRP has four phases consisting of Phase I, Initial Assessment/Records Search; Phase II, Confirmation and Quantification; Phase III, Technology Base Development; and Phase IV, Operations/Remedial Actions. Engineering-Science (ES) was retained by the United States Air Forces to conduct the Phase I, Initial Assessment/Records Search for O'Hare Air Reserve Forces Facility (ARFF) under Contract No. F08637-80-R0009.

INSTALLATION DESCRIPTION

The O'Hare Air Reserve Forces Facility complex at O'Hare International Airport is located in the Chicago metropolitan area in northeastern Illinois. The airport is located northwest of downtown Chicago at the boundary of Cook County and DuPage County. All of the property around the airport and Air Force installation is urbanized and used for residential, commercial and/or industrial purposes. The military portion of O'Hare Airport is composed of approximately 400 acres of land in the northwest corner of the airport.

Initially called Orchard Place Airport, the site was activated in October of 1942, when the government acquired a number of tracts of farm land. The War Assets Corporation erected buildings on this land and leased it in June, 1943, to Douglas Aircraft Company as an assembly plant for the C-54 cargo aircraft. The plant was closed in the fall of 1945.

In 1946, the site was reactivated as a military installation when the 803rd Army Air Force Reserve Specialized Depot assumed control of

the site. In 1949, the military portion was redesignated USAF O'Hare Field. Chicago International Airport. In 1970 the Lockheed C-130A "Hercules" arrived. The 928th Tactical Airlift Group is still the installation's host unit.

ENVIRONMENTAL SETTING

The environmental setting data reviewed for this investigation identified the following major points that are relevant to O'Hare ARFF.

- Net precipitation at the installation is 4.2 inches which indicates that there is some potential for leachate generation at hazardous waste sites and movement of contaminants in ground water. Rainfall intensity at the installation indicates that there is only a slight potential for erosion and transport of surface contamination from hazardous waste sites. The one-year, 24 hour rainfall event used to gauge erosion and runoff potential was 2.4 inches.
- The permeability of the surficial unconsolidated deposits at the installation is on the order of 10^{-7} cm/sec which does not allow for rapid infiltration of water.
- Four aquifer systems exist at the installation. These aquifer systems are in descending order, the glacial drift aquifer, the shallow dolomite aquifer, the Cambrian-Ordovician aquifer system and the Mt. Simon aquifer.
- The upper glacial drift and shallow dolomite aquifers at the installation are hydraulically connected and are separated from the underlying Cambrian-Ordovician and Mt. Simon aquifers by the relatively impermeable Makoqueta Shale.
- Numerous wells are located in the vicinity of the installation. Industrial and municipal wells near the installation generally withdraw water from the Cambrian-Ordovician aquifer system. One residential well and one test well identified from the available data withdraw water from the shallow dolomite aquifer. This water is high in dissolved solids and iron.
- Contamination of ground water may potentially occur at subsurface waste disposal sites on the installation. The glacial

deposits are at least periodically saturated at depths as shallow as 5 feet below land surface.

- o Surface runoff from the installation generally does not meet IEPA stream water quality standards, but is comparable to the water quality upstream in Willow Creek. This poor water quality is typical of highly urbanized areas.
- o Portions of the north end of the installation are within the 100-year flood plan.
- o No threatened or endangered plant or animal species inhabit the installation property.

METHODOLOGY

During the course of this project, interviews were conducted with installation personnel (past and present) familiar with past waste disposal practices; file searches were performed for past hazardous waste activities; interviews were held with local, state and federal agencies; and field and aerial surveys were conducted at suspected past hazardous waste activity sites. Eleven sites located within O'Hare ARFF boundaries were identified as potentially containing hazardous contaminants and having the potential for migration resulting from past activities (Figure 1). These sites have been assessed using a Hazard Assessment Rating Methodology (HARM) which takes into account factors such as site characteristics, waste characteristics, potential for contaminant migration and waste management practices. The details of the rating procedure are presented in Appendix G and the results of the assessment are given in Table 1. The rating system is designed to indicate the relative need for follow-on investigation.

FINDINGS AND CONCLUSIONS

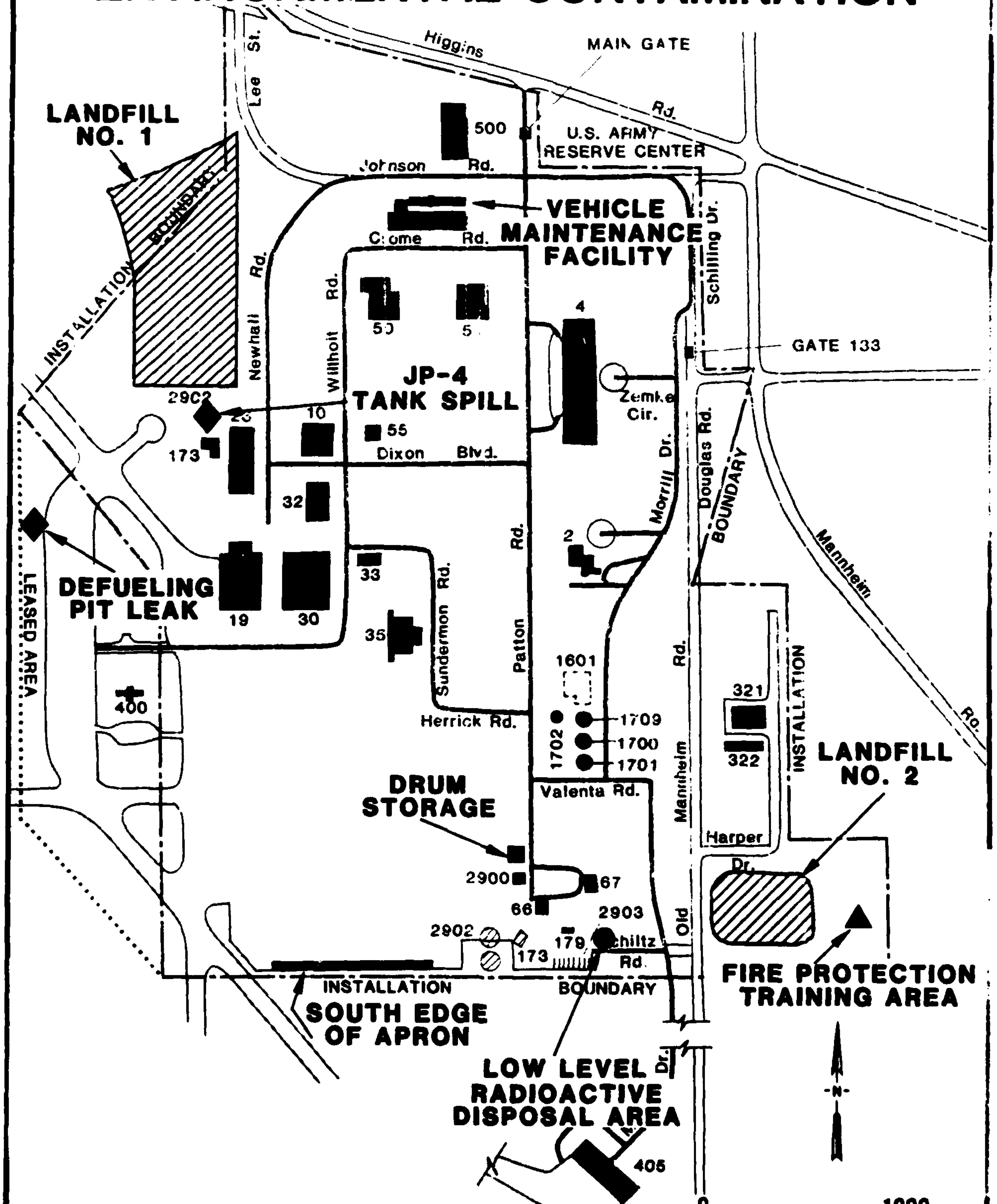
The following conclusions have been developed installationd on the results of the project team's field inspection, review of installation records and files, and interviews with installation personnel.

Nine areas were determined to have a sufficient potential for environmental contamination to warrant further investigaton. They are as follows:

FIGURE 1

O'HARE ARFF

SITES OF POTENTIAL ENVIRONMENTAL CONTAMINATION



SOURCE: O'HARE ARFF INSTALLATION DOCUMENTS

TABLE 1

PRIORITY RANKING OF POTENTIAL CONTAMINATION SOURCES

Rank	Site Name	Dates of Operation Or Occurrence	Overall HARM Score
1	Landfill No. 1	1953-1960's	68
2	JP-4 Tank, West POL Area	January 1972	65
3	Fuel-Contaminated Soil	1977	64
4	Defueling Pit Leak Site	Late 1960's	63
5	Fire Protection Training Facility	1955-early 1960's	60
6	Hazardous Waste Storage Area	1981-Present	58
7	Landfill No. 2	1965-early 1970's	55
8	Storm Drainage System	1942-Present	53
9	South Edge of Concrete Apron	Prior to 1970	52
10	Vehicle Maintenance Facility, Rear	Prior to 1977	49
11	Low Level Radioactive Disposal Site	Prior to 1970	44

- Landfill No. 1
- JP-4 Spill Site
- Defueling Pit Leak
- Fuel-Contaminated Soil
- Fire Protection Training Area
- Hazardous Waste Storage Area
- Landfill No. 2
- Storm Drainage System
- South Edge of Main Apron

The areas determined to have an insufficient potential for environmental contamination to warrant further investigation are as follows:

- Vehicle Maintenance Facility
- Low Level Radioactive Disposal Site

RECOMMENDATIONS

The recommendations developed for further assessment of environmental concern areas at O'Hare ARFF are presented below.

Landfill No. 1

Conduct geophysical survey to define the landfill boundaries and depth and identify any leachate plume. Based on the results of the geophysical survey, install one upgradient and 3 down gradient monitoring wells. Wells should be constructed using 3" Schedule 40 PVC, screened into the first sand and gravel lens (20' to 30' deep). Sample these wells and analyze for pH, total dissolved solids, total organic halogens, total organic carbon and phenol.

JP-4 Tank Dike Spill

Conduct geophysical survey around the tank farm to identify any JP-4 plume. Conduct a continuous core sampling in the dike area extended to the first sand and gravel lens. Observe if any JP-4 is present. Perform a water extract on 3 soil samples and analyze for oil and grease and total organic halogen.

Fuel-Contaminated Soil

Conduct geophysical survey around the site to identify any JP-4 plume. Conduct a continuous core sampling near the site extended to the

first sand and gravel lens (20'-30' deep). Observe if any JP-4 is present. Perform a water extract on 3 soils samples and analyze for oil and grease, and total organic carbon.

Defueling Pit Leak Site

Conduct geophysical survey around the site to identify any JP-4 plume. Conduct a continuous core sampling near the site extended to the first sand and gravel lens (20'-30' deep). Observe if any JP-4 is present. Perform a water extract on 3 soil samples and analyze for oil and grease, and total organic carbon.

Fire Protection Training Area

Conduct geophysical survey around the site to identify any leachate plume.

Hazardous Waste Storage Area

Conduct a continuous core sampling in the center of the site extended to the first sand and gravel lens (20'-30' deep). Observe if contamination present. Perform a water extract of 3 selected soil samples (in contaminated zones if present) and perform analyses for pH, total organic halogen and total organic carbon.

Landfill No. 2

Conduct geophysical survey to define the landfill boundaries and depth and identify any leachate plume. Based on the results of the geophysical survey, install one upgradient and two downgradient monitoring wells. Wells should be constructed of 3" Schedule 40 PVC, screened into the first sand and gravel lens (20'-30' deep). Sample these wells and analyze for pH, total organic carbon, total organic halogen, total dissolved solids and phenols.

Storm Drainage System Near Hangars

Conduct continuous core sample at the nearest wooden pipe section and at the nearest outfall extended to the first sand and gravel lens. Observe if contamination is present. Perform a water extraction of 3 samples and analyze for total organic halogen, total organic carbon and pH.

Spills along South Edge of Main Apron

Conduct a continuous core sampling at the edge of the apron extended to the first sand and gravel lens (20'-30' deep). Observe if any contamination present. Perform a water extract on 3 selected soil

samples (in contaminated zones if present) and perform analyses for pH, total organic halogen and total organic carbon.

SECTION 1

INTRODUCTION

BACKGROUND

The United States Air Force, due to its primary mission, has long been engaged in a wide variety of operations dealing with toxic and hazardous materials. Federal, state, and local governments have developed strict regulations to require that disposers identify the locations and contents of past disposal sites and take action to eliminate hazards in an environmentally responsible manner. The primary Federal legislation governing disposal of hazardous waste is the Resource Conservation and Recovery Act (RCRA) of 1976, as amended. Under Section 6003 of the Act, Federal agencies are directed to assist the Environmental Protection Agency (EPA) and under Section 3012, state agencies are required to inventory past disposal sites and make the information available to the requesting agencies. To assure compliance with these hazardous waste regulations, the Department of Defense (DOD) developed the Installation Restoration Program (IRP). The current DOD IRP policy is contained in Defense Environmental Quality Program Policy Memorandum (DEQPPM) 81-5, dated 11 December 1981 and implemented by Air Force message dated 21 January 1982. DEQPPM 81-5 reissued and amplified all previous directives and memoranda on the Installation Restoration Program. DOD policy is to identify and fully evaluate suspected problems associated with past hazardous contamination, and to control hazards to health and welfare that resulted from these past operations. The IRP will be the basis for response actions on Air Force installations under the provisions of the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) of 1980, and clarified by Executive Order 12316.

PURPOSE AND SCOPE OF THE ASSESSMENT

The Installation Restoration Program has been developed as a four-phased program as follows:

Phase I - Initial Assessment/Records Search
Phase II - Confirmation and Quantification
Phase III - Technology installation Development
Phase IV - Operations/Remedial Actions

Engineering-Science (ES) was retained by the United States Air Force to conduct the Phase I Records Search at O'Hare Air Reserve Forces Facility (ARFF), Contract No. F08637-80-R0009. This report contains a summary and an evaluation of the information collected during Phase I of the IRP and recommendations for follow on actions.

The goal of the first phase of the program was to identify the potential for environmental contamination from past waste disposal practices at O'Hare ARFF, and to assess the potential for contaminant migration. The activities that were performed in the Phase I study included the following:

- Review of installation records
- Interview of personnel familiar with past generation and disposal activities
- Survey of wastes
- Determination of estimated quantities and locations of current and past hazardous waste treatment, storage, and disposal
- Definition of the environmental setting at the installation
- Review of past disposal practices and methods
- Field inspection of installation facilities
- Collection of pertinent information from Federal, state and local agencies
- Assessment of potential for contaminant migration
- Development of follow-on recommendations.

ES performed the on-site portion of the records search during August 1983. The following team of professionals were involved:

- D. L. Gregory, Environmental Engineer and Project Manager, MSCE, 5 years of professional experience
- H. D. Harmon, Hydrogeologist, 9 years of professional experience
- R. J. Reimer, Chemical Engineer, 4 years of professional experience

More detailed information on these three individuals is presented in Appendix A.

METHODOLOGY

The methodology utilized in the O'Hare ARFF Records Search began with a review of past and present industrial operations conducted at the installation. Information was obtained from available records and files, as well as interviews with past and present installation employees from the various operating areas. Those interviewed included - current and past personnel associated with Civil Engineering, Consolidated Aircraft Maintenance, Base Supply, and the Base Clinic. A listing of the installation interviewees by position and approximate years of service is presented in Appendix B.

Concurrent with the installation interviews, the applicable Federal, state and local agencies were contacted for pertinent installation-related environmental data. The agencies contacted and interviewed are listed below and additional information is included in Appendix B.

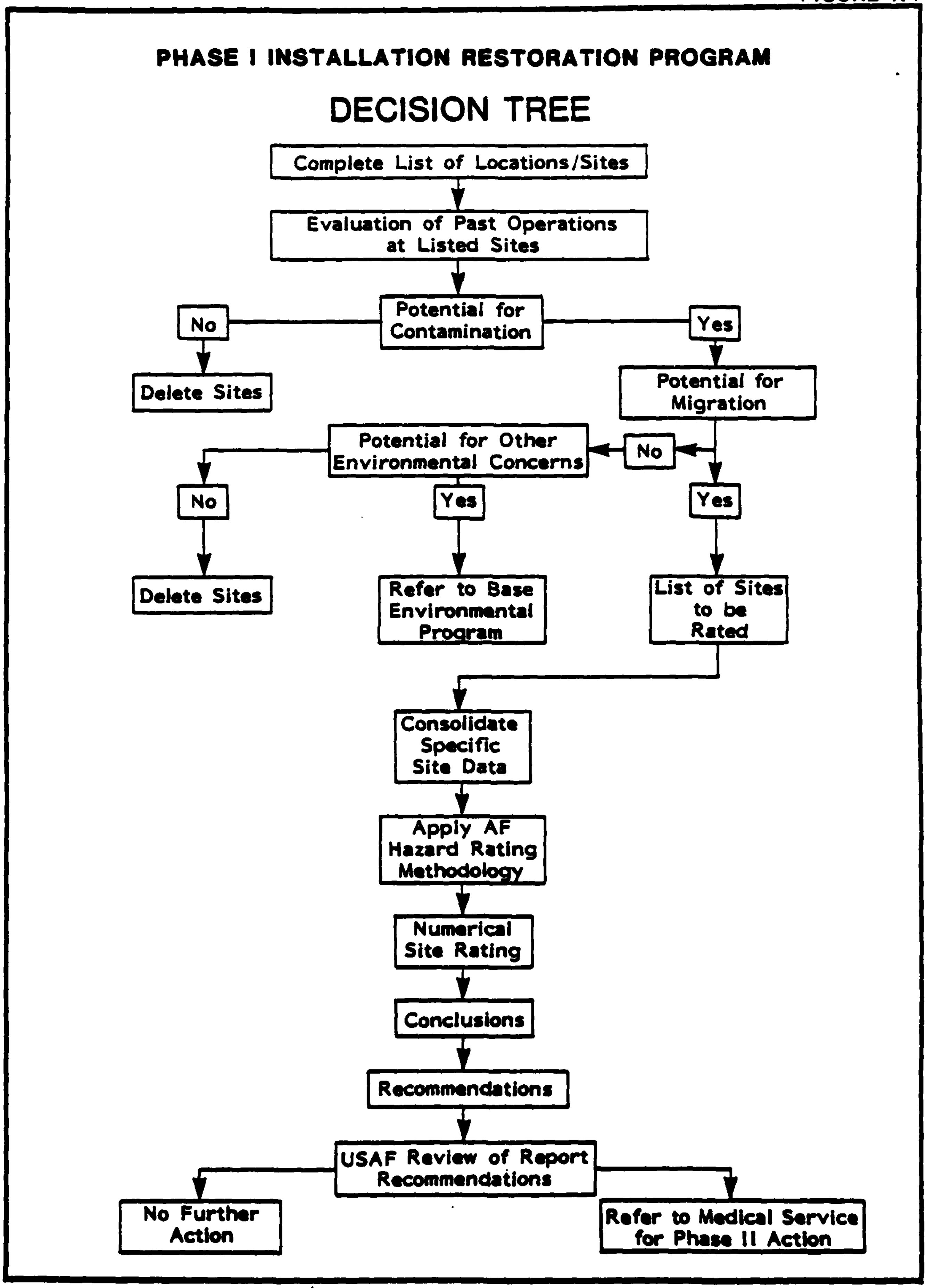
- U.S. Environmental Protection Agency (EPA), Region V
- U.S. Geological Survey (USGS), Water Resources Division
- Illinois Environmental Protection Agency
- Illinois Department of Conservation
- Illinois Department of Energy and Natural Resources, State Water Survey Division
- City of Chicago, Department of Aviation

The next step in the activity review was to determine the past management practices regarding the use, storage, treatment, and disposal of hazardous materials from the Air Force operations at the installation. Included in this part of the activities review was the identification of all known past disposal sites and other possible sources of contamination such as spill areas.

A general ground tour of the identified sites was then made by the ES Project Team to gather site-specific information including: (1) visual evidence of environmental stress; (2) the presence of nearby drainage ditches or surface water bodies; and (3) visual inspection of these water bodies for any obvious signs of contamination or leachate migration.

A decision was then made, installationd on all of the above information, whether a potential exists for hazardous material contamination at any of the identified sites using the Decision Tree shown in Figure 1.1. If no potential existed, the site was deleted from further consideration. For those sites where a potential for contamination was identified, a determination of the potential for migration of the contamination was made by considering site-specific conditions. If there were no further environmental concerns, then the site was deleted. If the potential for contaminant migration was considered significant, then the site was evaluated and prioritized using the Hazard Assessment Rating Methodology (HARM). A discussion of the HARM system is presented in Appendix G. The sites that were evaluated using the HARM procedures were also reviewed with regard to future land use restrictions.

FIGURE 1.1


PHASE I INSTALLATION RESTORATION PROGRAM
DECISION TREE
Complete List of Locations/Sites
Evaluation of Past Operations at Listed Sites
Potential for Contamination
No
Yes
Delete Sites
Potential for Migration
Potential for Other Environmental Concerns
No
No
Yes
Yes
Delete Sites
Refer to Base Environmental Program
List of Sites to be Rated
Consolidate Specific Site Data
Apply AF Hazard Rating Methodology
Numerical Site Rating
Conclusions
Recommendations
USAF Review of Report Recommendations
No Further Action
Refer to Medical Service for Phase II Action

SECTION 2

INSTALLATION DESCRIPTION

LOCATION, SIZE AND BOUNDARIES

O'Hare Air Reserve Forces Facility at O'Hare International Airport is located in the Chicago metropolitan area in northeastern Illinois (Figures 2.1 and 2.2). The airport is located northwest of downtown Chicago at the boundary of Cook County and DuPage County. All of the property around the airport and Air Force installation is urbanized and used for residential, commercial and/or industrial purposes. The military portion of O'Hare Airport is composed of approximately 400 acres of land in the northeast corner of the airport. The Air Force also leases a portion of the southeast taxiway. The Air Force has retained the priority use of all runways. Figure 2.3 depicts the configuration of the installation property.

INSTALLATION HISTORY

Initially called Orchard Place Airport, the site was activated in October of 1942, when the government acquired a number of tracts of farm land. The War Assets Corporation erected buildings on this land to be used for an aircraft assembly plant.

In June of 1943, the installation was leased to Douglas Aircraft Company as an assembly plant for the C-54 cargo aircraft. The site was known as the "Chicago Aircraft Assembly Plant Number 8." During the years of 1943 to 1945, approximately 665 aircraft were assembled and delivered to the Army Air Corps. The plant was then closed in the fall of 1945.

In 1946, the site was reactivated as a military installation when the 803rd Army Air Force Reserve Specialized Depot assumed control of the site. During this time, the 141st Air Force installation unit for reserve training was activated at the renamed Douglas-Orchard Airport.

In 1948, the 141st was replaced by the 2471st AF Reserve Combat Training Center. In 1949, both the 437th and the 441st Troop Carrier

FIGURE 2.1

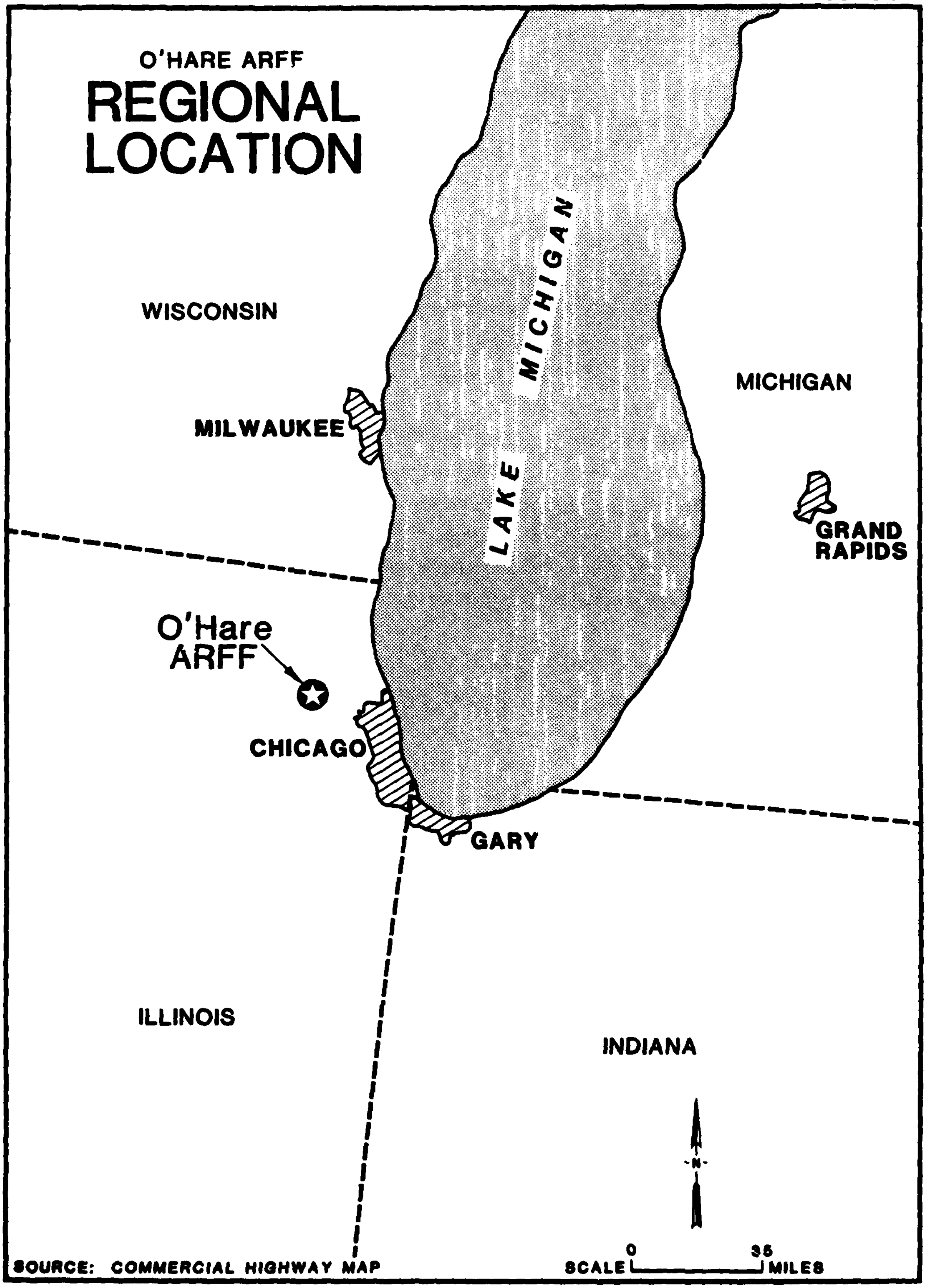
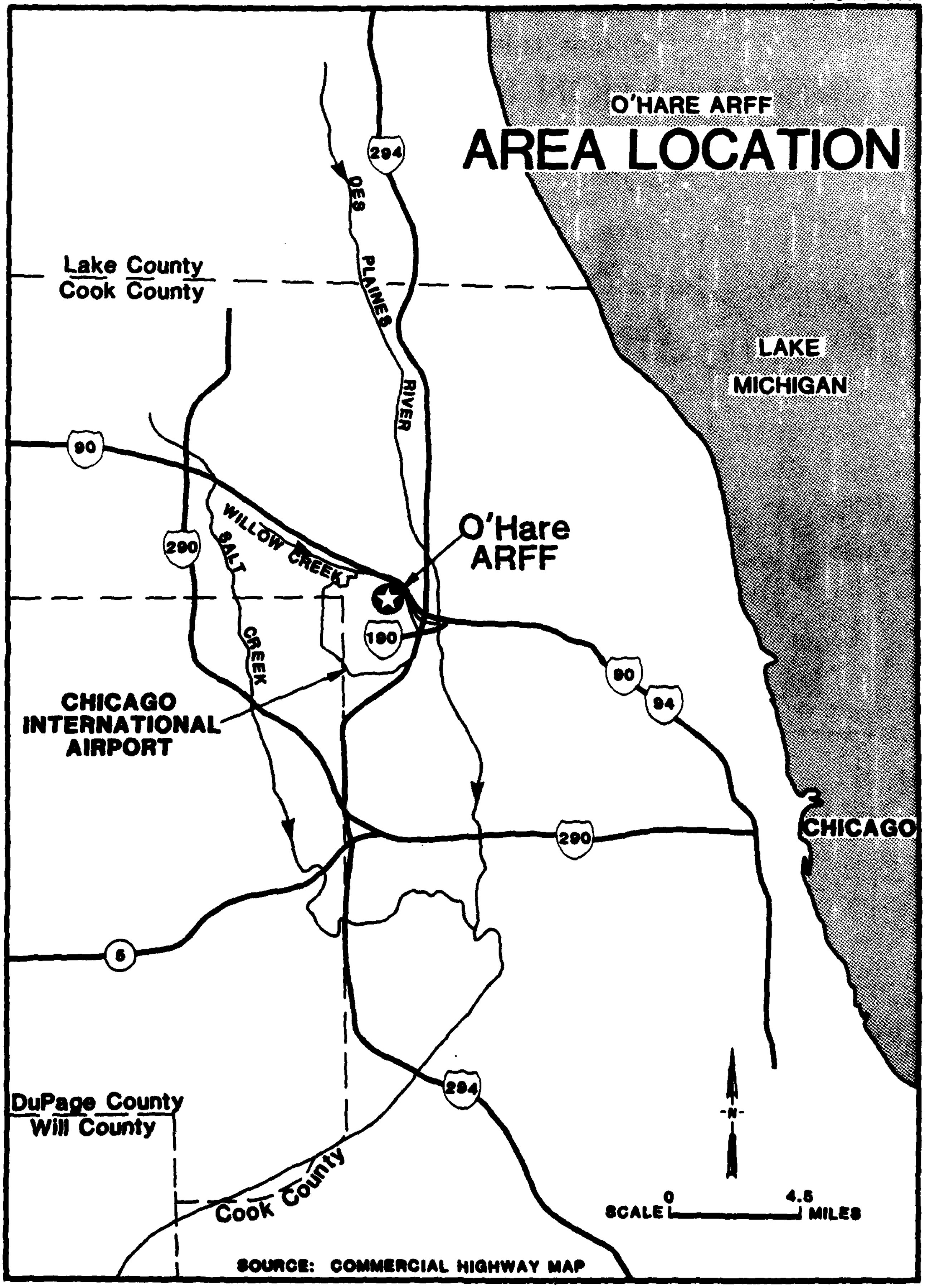

O'HARE ARFF
REGIONAL LOCATION
WISCONSIN
LAKE MICHIGAN
MICHIGAN
MILWAUKEE
GRAND RAPIDS
O'Hare ARFF
CHICAGO
GARY
ILLINOIS
INDIANA
N
SOURCE: COMMERCIAL HIGHWAY MAP
SCALE 0 35 MILES

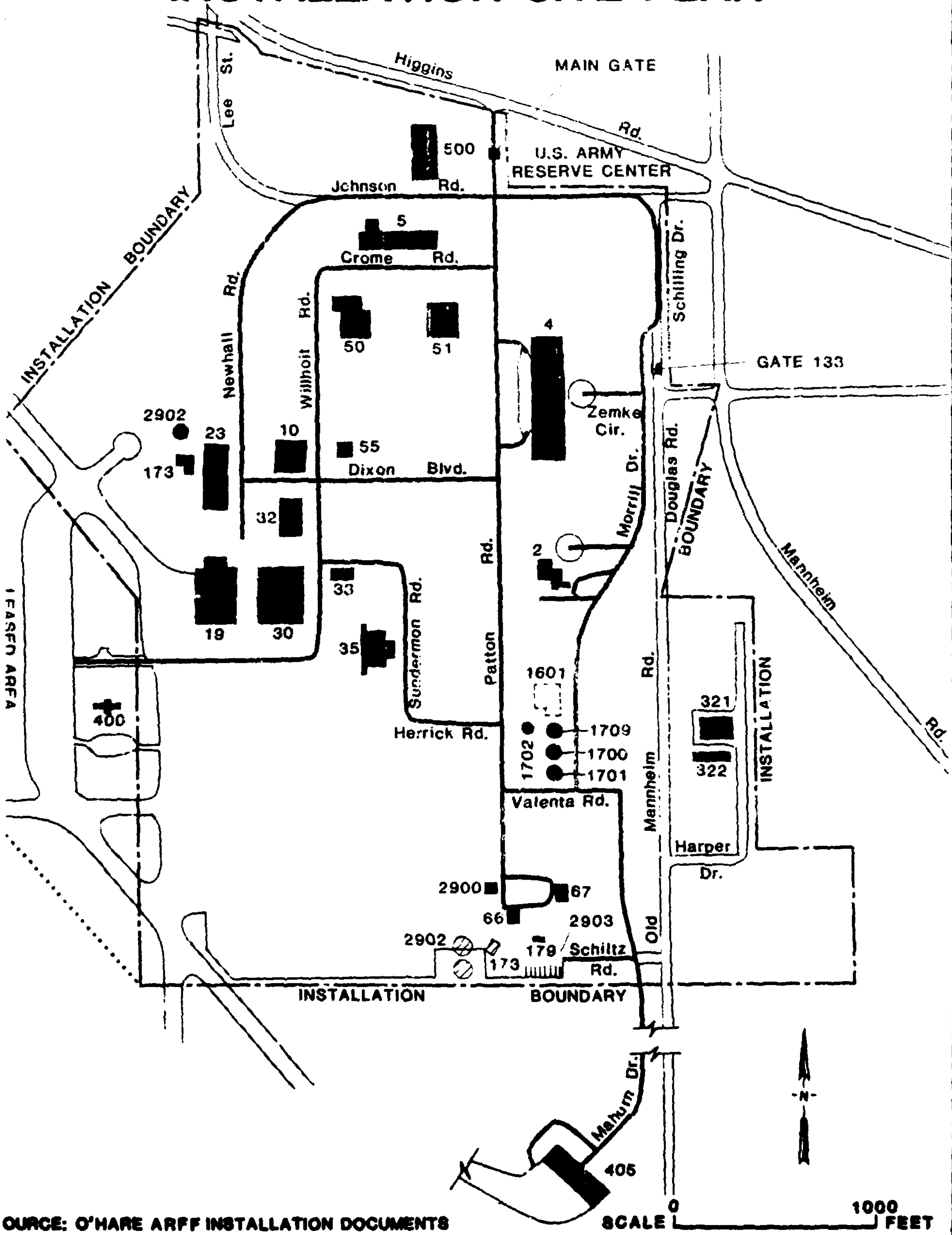
FIGURE 2.2



ES ENGINEERING-SCIENCE

O'HARE ARFF

INSTALLATION SITE PLAN



SOURCE: O'HARE ARFF INSTALLATION DOCUMENTS

Wings Reserve were activated. In 1949, the military portion was redesignated USAF O'Hare Field, Chicago International Airport.

From October 1950 until December 1957, the 2471st AFRCTC remained the supervisory unit. In 1955, the airfields were opened to commercial traffic.

From May 1957 until October 1970, the 928th Tactical Airlift Group was equipped with the Fairchild C-119 "Flying Boxcar", and in 1970 the Lockheed C-130A "Hercules" arrived. The 928th TAG is still the installation's host unit.

ORGANIZATION AND MISSION

O'Hare ARFF at O'Hare International Airport has a fulltime staff of 1,544 employees. For one weekend per month and two full weeks per year, the installation serves as a training facility for approximately 2400 Air Force Reservists and Air National Guardsmen.

The host organization at O'Hare ARFF is the 928th Tactical Airlift Group (TAG). The primary mission of the 928th TAG is to provide individual and unit training in the C-130A, tactical airlift support for airborne forces, equipment, supplies and aeromedical evacuation within a theater of operations. Additionally, the Group operates and maintains the Air Force complex at O'Hare, represents the Air Force in the Chicago metropolitan area, and provides logistical support to various on/off installation tenants.

The on-installation tenants at the O'Hare ARFF are listed below. Descriptions of the major tenant and other installation organizations and their missions are presented in Appendix C.

- Defense Contract Administration Services Region
- Defense Logistics Agency
- Headquarters, Illinois Air National Guard (Ill ANG)
- 126th Air Refueling Wing, Ill ANG
- 126th Combat Support Group, Ill ANG
- 108th Air Refueling Squadron, Ill ANG
- 126th Consolidated Aircraft Maintenance Squadron, Ill ANG
- 126th USAF Clinic, Ill ANG
- 126th Civil Engineering Flight, Ill ANG

- 126th Communications Flight, Ill ANG
- 217th Electronics Installation Squadron, Ill ANG
- 264th Communications Squadron, Ill ANG
- 566th USAF Band, Ill ANG
- USAF Liaison Office/National Scouting Organization
- 36th Medical Service Evacuation Squadron
- Aeronautical Systems Division, Reserve Detachment (AFLC)
- Corps of Engineers Field Office

SECTION 3

ENVIRONMENTAL SETTING

The environmental setting of O'Hare Air Reserve Forces Facility (ARFF) is described in this section with an emphasis on the identification of natural features that may promote the movement of hazardous waste contaminants. Environmental conditions pertinent to this study are summarized at the conclusion of this section.

METEOROLOGY

Two climatic features of interest in determining the potential for movement of contaminants are net precipitation and rainfall intensity. Net precipitation is an indicator for the potential of leachate generation and is equal to the difference between annual precipitation and annual evaporation. Rainfall intensity is an indicator for the potential of excessive runoff and erosion. The one-year, 24-hour rainfall event is used to gauge the potential for runoff and erosion.

Net precipitation at Chicago O'Hare ARFF is 4.2 inches as determined from meteorological records. Normal annual precipitation at O'Hare International Airport for the period 1958 to 1981 is 34.17 inches (National Oceanic and Atmospheric Administration (NOAA), 1981) and annual evaporation for the area is 30 inches (NOAA, 1977). This value of net precipitation indicates that there is some potential for leachate generation at hazardous waste sites on the installation as a result of rainfall. Selected meteorological data are summarized in Table 3.1.

The one-year, 24-hour rainfall event for the installation is 2.4 inches (NOAA, 1968). This value indicates that there is a moderate potential for erosion and transport of surface contamination from hazardous waste sites on the installation.

TABLE 3.1
SUMMARY OF METEOROLOGICAL DATA[1]

	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Temperature (°F)													
Mean	20.4	25.0	36.1	48.8	59.0	68.5	72.8	71.9	64.6	53.1	40.0	27.0	49.0
Precipitation (inches)													
Mean	1.64	1.30	2.60	3.87	3.26	4.19	3.50	3.63	3.86	2.05	2.12	2.15	34.17
Max. Monthly	4.11	2.70	5.91	6.28	7.14	7.94	5.27	8.54	11.44	6.55	4.74	5.37	11.44
Min. Monthly	0.10	0.12	0.63	0.97	1.61	1.68	1.18	0.51	0.02	0.16	0.65	0.23	0.02
Snowfall (inches)													
Max. Monthly	34.3	21.5	24.7	11.1	1.6	0.0	0.0	0.0	T[2]	6.6	10.4	35.3	35.3

(1) Based on the period 1958 to 1981
(2) Trace

GEOGRAPHY

The installation is located northwest of Chicago, Illinois in the Glaciated Central Region ground-water basin. The landscape of the region ranges from a low, flat plain east of the installation to a poorly drained hilly belt west of the installation. The area around the installation is highly urbanized.

The installation is in the Des Plaines River drainage basin which is the major drainage basin in the area. The Des Plaines River originates near the Illinois-Wisconsin border approximately 30 miles north of the installation. The river empties into the Illinois River approximately 50 miles south of the installation. The river flows generally south in the vicinity of the installation (Figure 3.1).

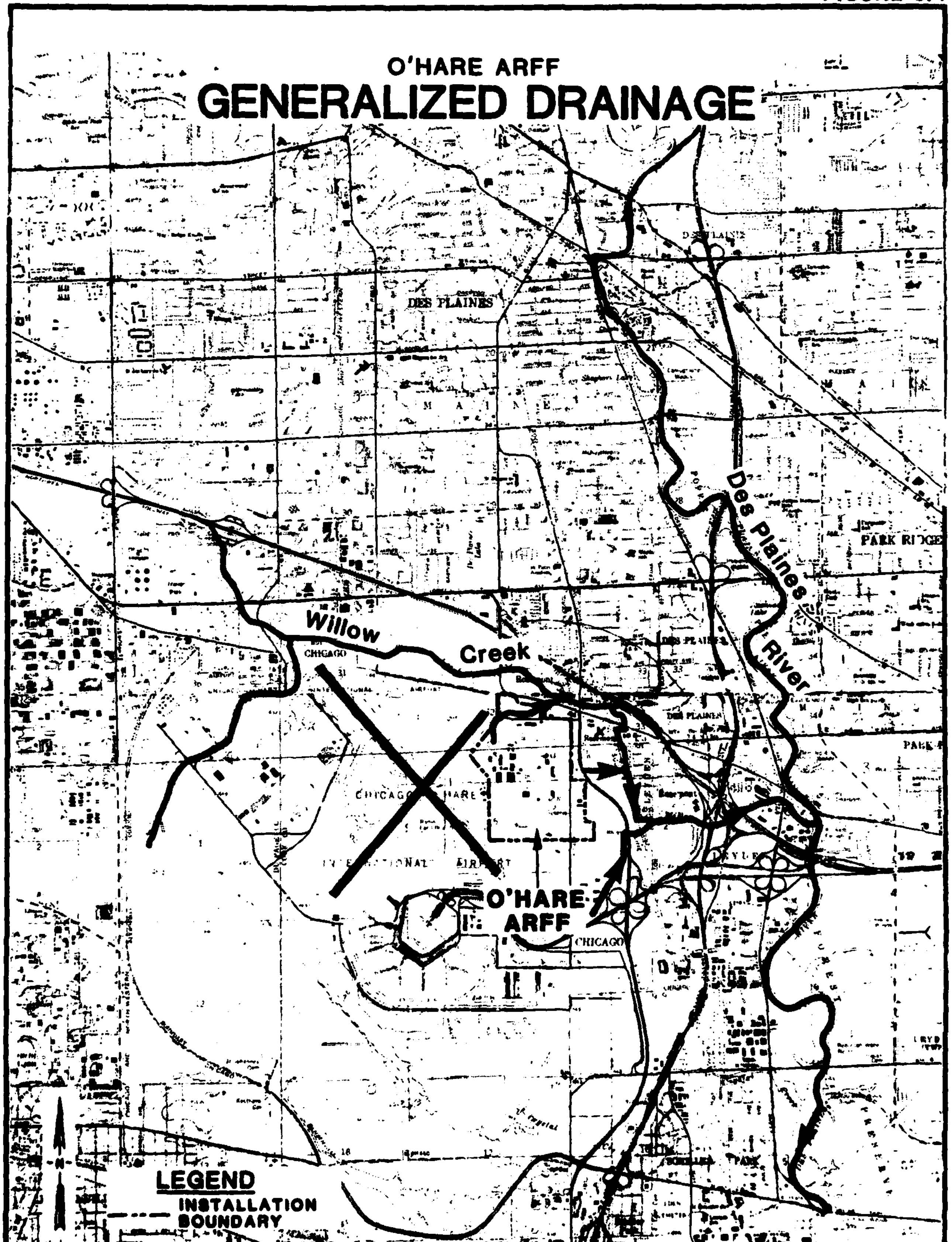
Topography and Drainage

The topography at O'Hare ARFF slopes very gently to the northeast. The highest point on the installation is about 650 feet mean sea level (MSL). This point occurs along the western border of the installation near runway 22R. The lowest point is approximately 635 feet MSL and occurs along a drainage ditch near the installation's northern boundary.

Open drainage ditches traverse the northwest and north ends of the installation (Figure 3.2). One drainage ditch flows east near the northern boundary of the installation. This drainage ditch enters the installation near the end of runway 22R. The drainage ditch exits the installation under Higgins Road near the installation main gate and flows into Willow Creek. A second drainage ditch flows north along the northwest boundary of the installation and discharges into the eastward flowing drainage ditch. Overland runoff from the northwest corner of the installation discharges to these drainage ditches. Storm drainage from the northern end of O'Hare International Airport drains into the eastward flowing drainage ditch which traverses the northwest corner of the installation.

Storm drainage from the installation discharges to Willow Creek, a tributary of the Des Plaines River. Storm drains on the installation direct storm runoff to an open ditch that begins at Mannheim Road east of the installation. The open ditch drains east about 1,300 feet to Willow Creek. The relationship between Willow Creek and installation drainage structures is shown on Figure 3.2.

FIGURE 3.1

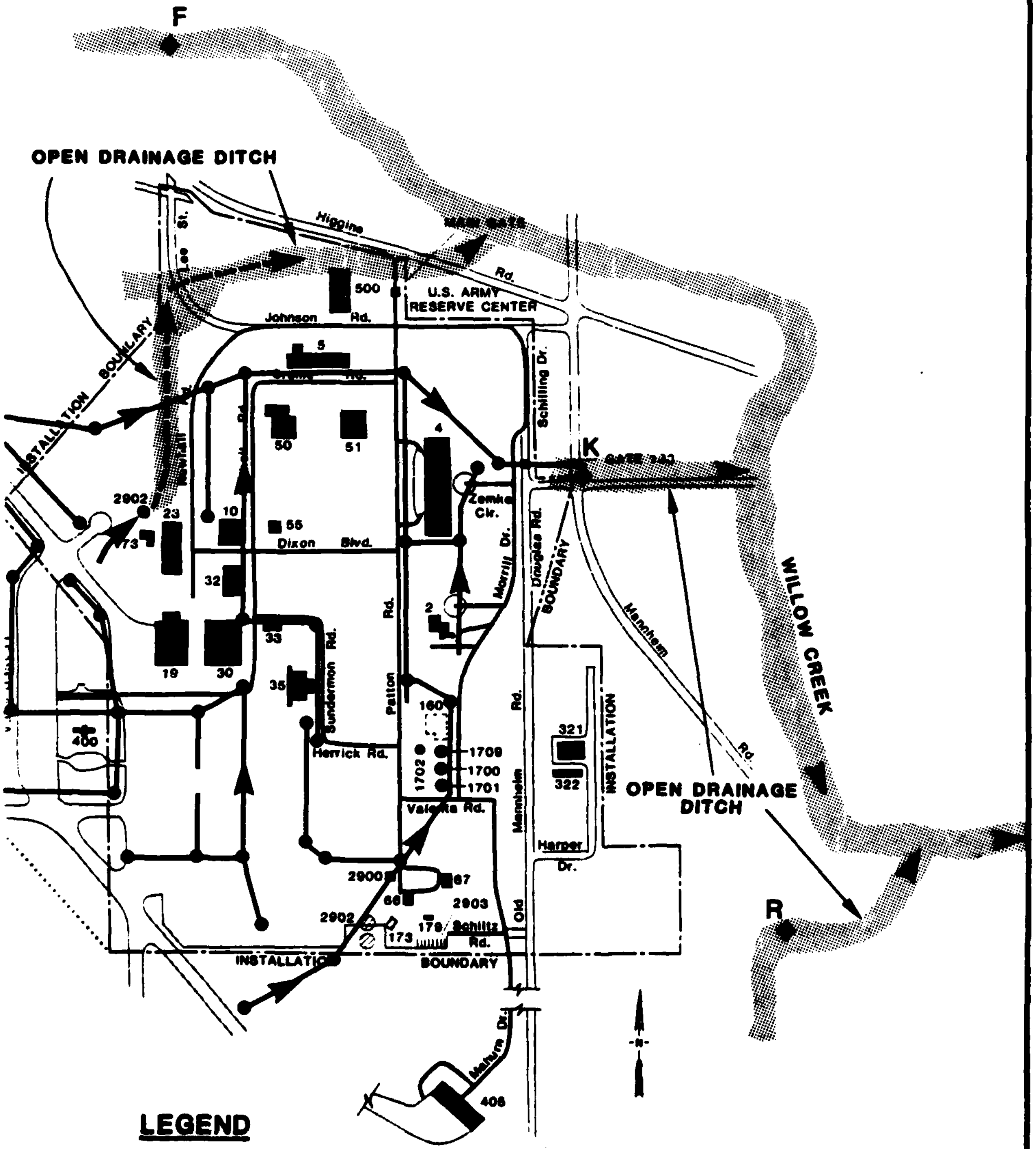


ES ENGINEERING-SCIENCE

FIGURE 3.2

O'HARE ARFF

STORM DRAINAGE AND WATER QUALITY MONITORING SITES



LEGEND

◆ WATER QUALITY MONITORING SITE

STORM DRAINAGE AND DIRECTION OF FLOW

OURCE: O'HARE ARFF INSTALLATION DOCUMENTS

SCALE 0 1000 FEET

GEOLOGY

Stratigraphy

O'Hare ARFF is underlain by rocks of Precambrian age and younger and unconsolidated glacial deposits. A stratigraphic column representing the sequence of rocks in the area is given in Table 3.2.

Dense crystalline rock of Precambrian age forms the installationment upon which younger geologic units were deposited. The depth below land surface to these rocks is probably greater than 4,000 feet at the installation. The only well in the Chicago area known to penetrate the Precambrian was drilled approximately 6 miles west of Joliet, Illinois. (Bradbury and Atherton, 1965).

A layered sequence of gently eastward dipping sedimentary rocks of Cambrian and Ordovician age overlie the Precambrian rocks. These rocks are mainly sandstone and dolomite and are probably greater than 3,000 feet thick at the installation. (Hughes and others, 1966). The Ordovician age rocks have a combined thickness of about 800 feet in the vicinity of the installation.

Silurian age dolomite overlies the Ordovician rocks and is the upper bedrock unit at the installation. This unit is mostly dense dolomite with many joints and solution channels. It's thickness is about 135 feet in the vicinity of the installation.

The thickness of the Ordovician and Silurian rocks were derived from a drilling log for a well that was drilled for the Twin Orchard Country Club prior to the existence of the airport. This well was drilled in 1925 to a total depth of 1,410 feet. The approximate well location is shown on Figure 3.3.

Unconsolidated glacial deposits of Quaternary age overlie the bedrock to a thickness of 70 to 85 feet at the installation (Figure 3.4). These deposits consist of stratified clay, sand and gravel. The deposits appear to thicken toward the north end of the installation.

The surficial deposits at the installation are mostly artificial fill underlain by clay. The composition of unconsolidated deposits near the surface is described in Table 3.3.

TABLE 3.2
GENERALIZED STRATIGRAPHY

System	Group or Formation	Thickness	Lithology
Quaternary		70-85	Clay, sand and gravel, till
Silurian	Niagara Dolomite Alexandrian Series	135	Dolomite
Ordovician	Maquoketa Shale	230	Shale
	Galena Dolomite Decorah Formation Platteville Formation	320	Dolomite
	Glenwood Formation St. Peter Sandstone	145	Sandstone, fine to coarse grained
	Prairie du Chien Group	95	Dolomite
Cambrian	Trempealeau Formation	125	Dolomite
	Franconia Formation	90	Dolomite and sandstone
	Ironton Sandstone Galesville Sandstone	200+	Sandstone, fine to medium grained
	Eau Claire Formation	235-450	Shale and siltstone
	Mt. Simon Sandstone	2000±	Sandstone, coarse grained

Precambrian crystalline rocks

FIGURE 3.3

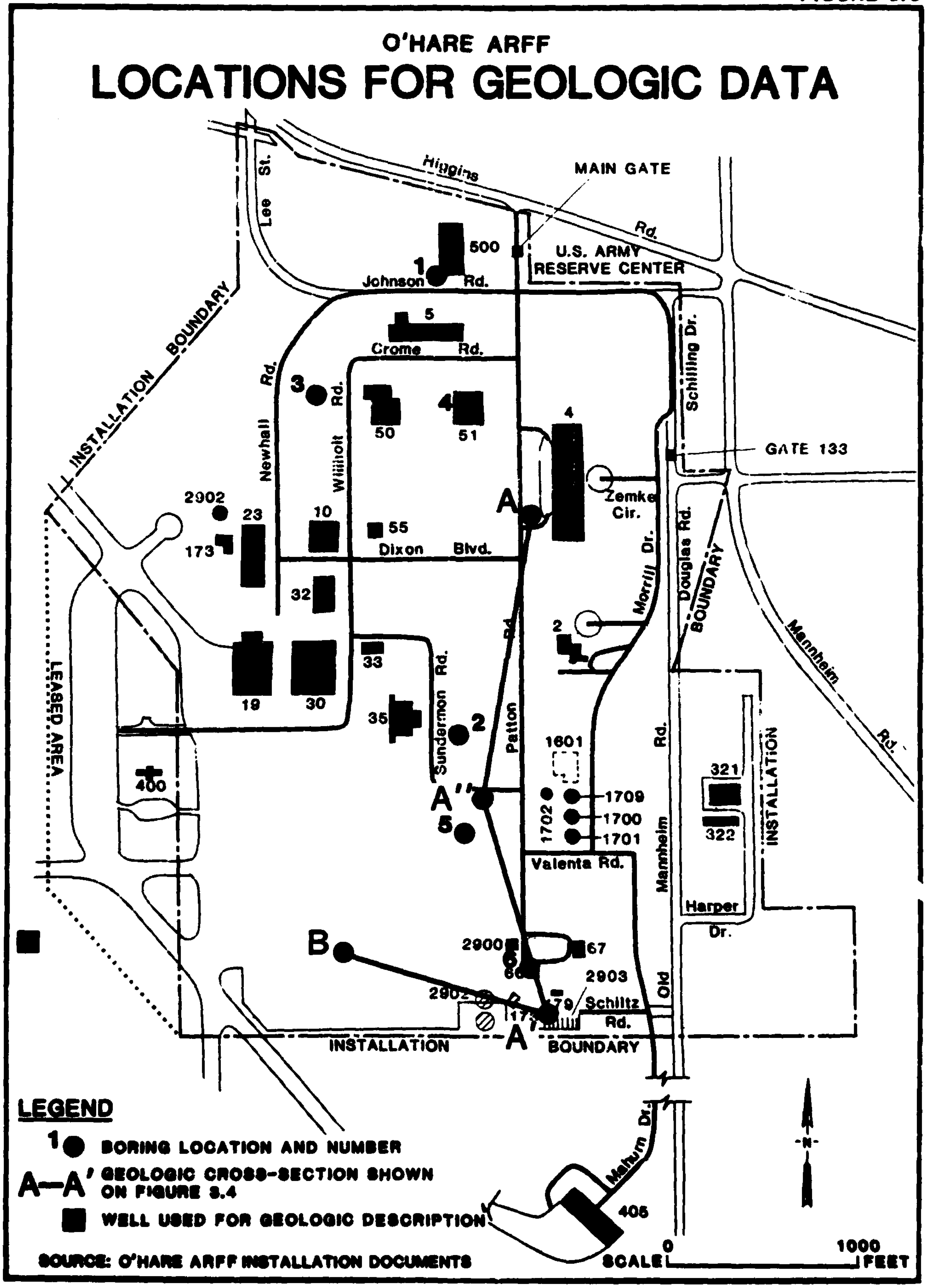

O'HARE ARFF
LOCATIONS FOR GEOLOGIC DATA
Higgins Rd.
MAIN GATE
Lee St.
500
U.S. ARMY RESERVE CENTER
Johnson Rd.
5
Crome Rd.
Schilling Dr.
INSTALLATION BOUNDARY
Newhall Rd.
Wiiliott Rd.
50
51
4
GATE 133
Zemke Cir.
2902
23
10
55
173
Dixon Blvd.
32
Patton Rd.
Morrill Dr.
Douglas Rd.
BOUNDARY
Mannheim Rd.
2
33
19
30
35
Sundermon Rd.
1601
321
322
1709
1700
1701
1702
Valenta Rd.
Mannheim Rd.
INSTALLATION
LEASED AREA
400
Harper Dr.
2900
67
2903
Schiltz Rd.
Old
INSTALLATION
BOUNDARY
Mahum Dr.
405
N
LEGEND
BORING LOCATION AND NUMBER
A—A' GEOLOGIC CROSS-SECTION SHOWN ON FIGURE 3.4
WELL USED FOR GEOLOGIC DESCRIPTION
SOURCE: O'HARE ARFF INSTALLATION DOCUMENTS
SCALE 0 1000 FEET

FIGURE 3.4

O'HARE ARFF

GENERALIZED GEOLOGIC CROSS-SECTIONS

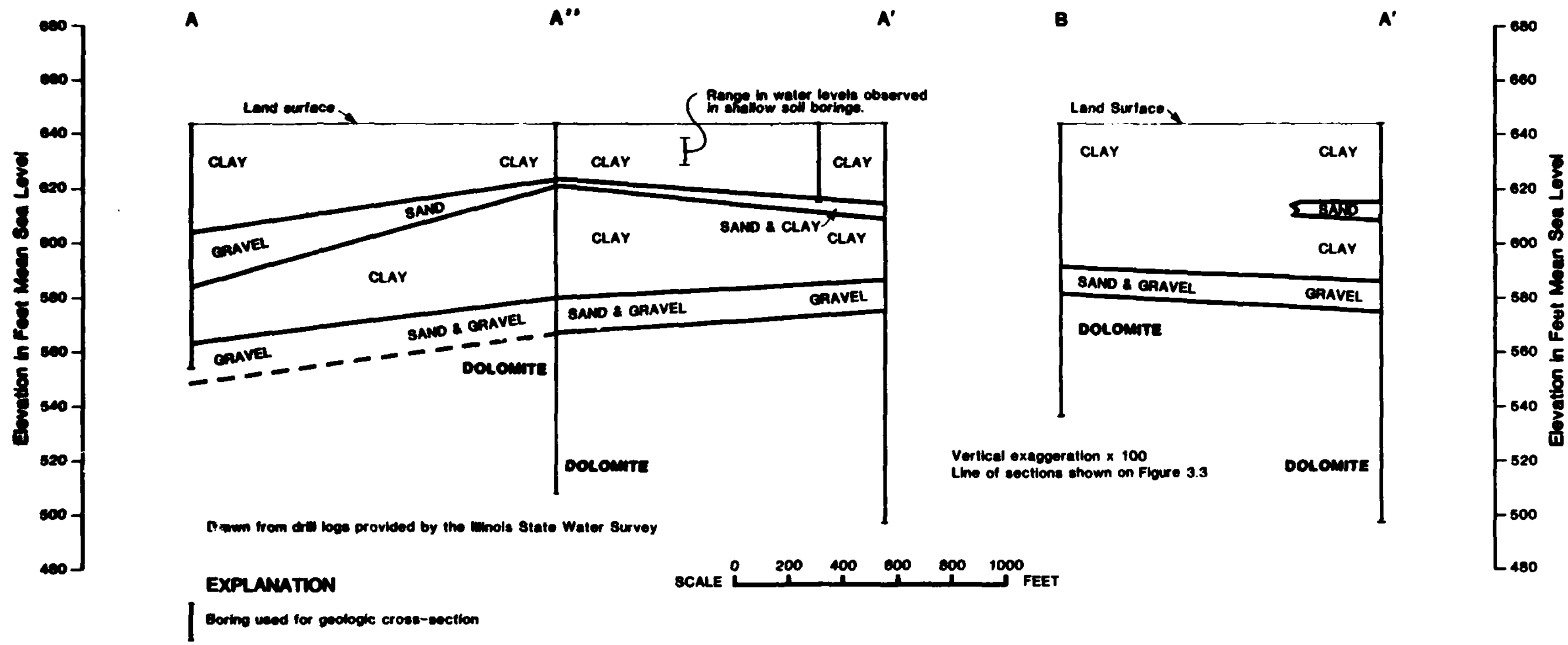


TABLE 3.3
SUMMARY OF SELECTED SOIL BORINGS

Boring No.	Other Boring I.D.	Boring Depth (Feet)	Lithology
1	DH77-1	0 - 1.5	Top soil
		1.5 - 7.0	Clay, brown
		7.0 - 11.0	Clay, brown and gray
		11.0 - 18.0	Clay, gray, trace sand and gravel
		18.0 - 20.0	Sandy silt
2	DH77-18	0 - 3.0	Fill, concrete and sand
		3.0 - 9.0	Clay, brown and gray
		9.0 - 14.5	Clay, gray
		14.5 - 22.0	Sandy clay, gray
3	DH80-8	0 - 1.0	Fill, concrete
		1.0 - 2.5	Sandy clay, brown
		2.5 - 4.0	Clay, dark gray
		4.0 - 18.0	Clay, gray
		18.0 - 22.0	Silty sand
		22.0 - 29.0	Clay, gray, with sand and gravel
4	-	0 - 6.0	Fill
		6.0 - 8.5	Silty clay, brown and gray
		8.5 - 18.5	Silty clay, trace of gravel
		18.5 - 23.5	Silt, some sand layers
		23.5 - 25.0	Silty clay, trace sand and gravel
5	DH75-1	0-0.5	Fill
		0.5 - 8.0	Clay, brown
		8.0 - 15.0	Clay, grades from brown to gray
		15.0 - 24.0	Clay, with silt and sand layers
		24.0 - 25.0	Sand clay
6	DH75-7	0-1.0	Fill
		1.0 - 15.0	Clay, tan to brown, slightly sandy
		15.0 - 18.0	Clay, gray
		18.0 - 29.0	Sandy clay
		29.0 - 31.0	Silty sand

Modified from O'Hare ARFF drawings
Boring locations shown on Figure 3.3

Structure

The Chicago area is located near the crest of a broad, gently sloping arch composed mostly of Cambrian, Ordovician and Silurian rocks. The longitudinal axis of this arch runs generally in a northwest-southeast direction. The rocks have a general eastward dip that results from the eastward plunge of the arch.

The major structural feature near the installation is the Des Plaines Disturbance. Rocks in the area of the Disturbance are intensely faulted. The origin of the faulting is unknown but has been speculated to have been caused by a meteorite impact (Willman, 1971). The area of the Des Plaines Disturbance is approximately five-miles square. The southern end of the Disturbance is located approximately one-mile north of the installation.

HYDROLOGY

Subsurface Hydrology

There are four major aquifer systems in the vicinity of O'Hare ARFF. These aquifer systems are sand and gravel deposits of the glacial drift, shallow dolomites composed mostly of Silurian age rocks, the Cambrian-Ordovician aquifer system and the Mt. Simon aquifer. The glacial drift and shallow dolomite aquifers are separated from the underlying deeper aquifers by the Maquoketa Shale.

The glacial drift and shallow dolomite are of greatest interest for this study. These are the uppermost geologic units at the installation.

The glacial drift and shallow dolomite are both recharged locally from precipitation and are hydrologically connected in the Chicago area (Suter, 1959). The hydrologic connection is generally good whenever sand and gravel directly overlies the dolomite. This situation exists at O'Hare ARFF (Figure 3.4).

The glacial drift in the vicinity of the installation has an average vertical hydraulic conductivity, or permeability, on the order of 0.005 gallons per day per square foot (2.4×10^{-7} centimeters per second). This estimate assumes that recharge through the drift averages 140,000 gallons per day per square mile and that recharge is occurring

under a unit hydraulic gradient. These assumptions appear reasonable based on work done by Walton (1965) in DuPage county that is immediately west of the installation. This permeability estimate indicates that percolation to the water table of the installation is low.

Ground-water elevations and ground-water flow directions in the shallow dolomite are not known at the installation. Water levels in borings completed in the shallow dolomite on the installation stood at an elevation of 625 to 630 feet mean sea level in 1942. This water level was 15 to 20 feet below land surface. Water levels in the shallow dolomite were generally greater than 50 feet below land surface in DuPage County west of the installation in 1965 (Walton, 1965).

The unconsolidated deposits are saturated in part at the installation (Figure 3.4). Water levels have been observed 5 to 15 feet below land surface in shallow soil borings drilled on the installation between 1975 and 1980 for foundation investigations.

There is a potential for contamination of ground water to occur at subsurface waste disposal sites on the installation. The glacial deposits are at least periodically saturated at depths of 5 feet and more below land surface. Waste material buried to depths of 5 feet or more would be periodically saturated and could create leachate. Also, there would be a tendency for the leachate to move downward to the shallow dolomite aquifer.

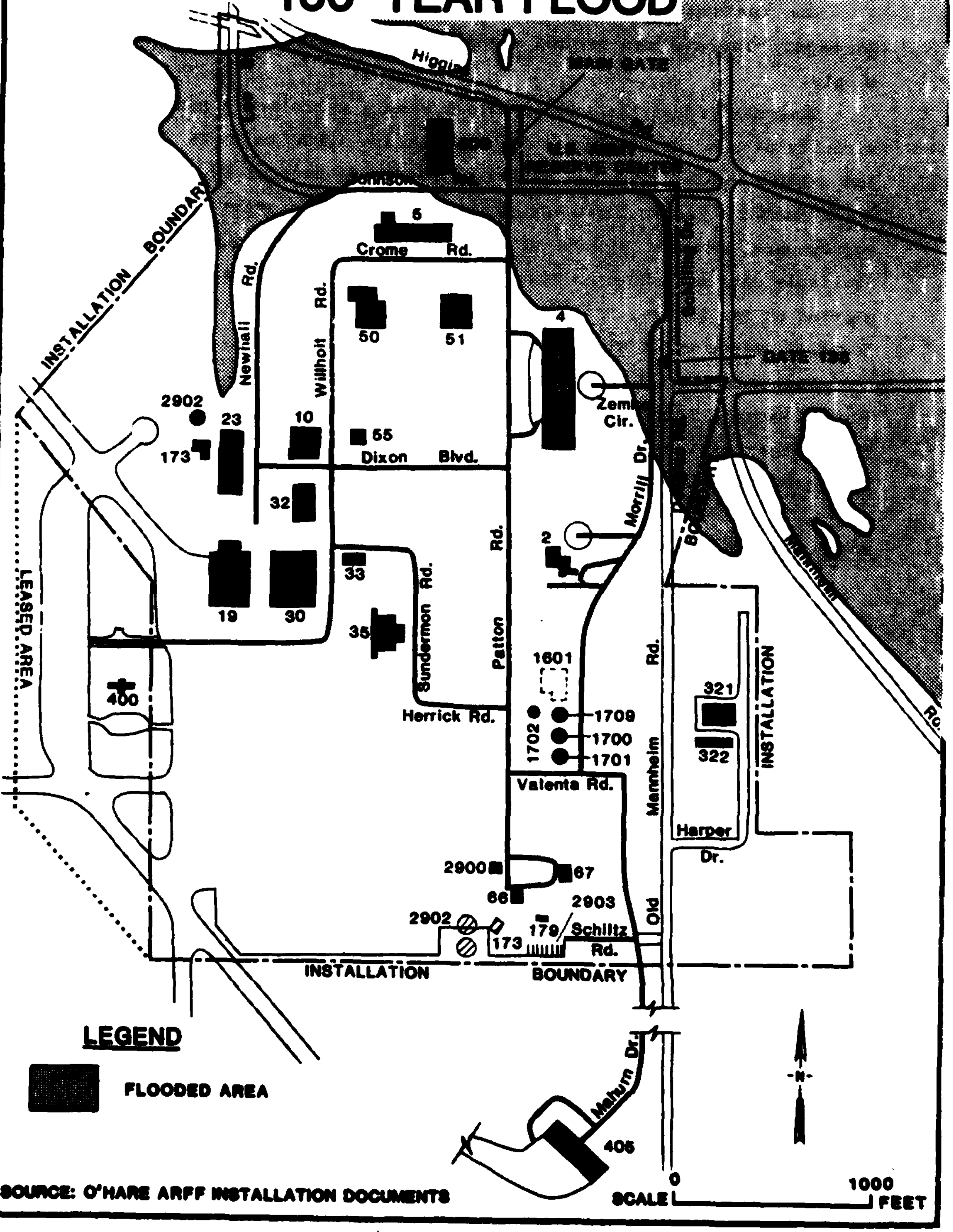
Surface Hydrology

O'Hare ARFF is in the Willow Creek drainage basin. The installation is drained by a combination of open channels and drainage structures that discharge to the creek (Figure 3.2). The main stem of Willow Creek does not traverse the installation.

Periodic flooding can be expected at the north end of the installation. These floodwaters originate mostly as runoff from O'Hare International Airport and from the urbanized area west and north of the airport. The approximate limits of flooding for the 100-year flood event are shown on Figure 3.5.

FIGURE 3.5

O'HARE ARFF
AREA INUNDATED BY THE 100-YEAR FLOOD



SOURCE: O'HARE ARFF INSTALLATION DOCUMENTS

WATER USE

The installation receives its water supply from the City of Chicago. Surface and ground waters are not used for installation supply.

Numerous industrial and municipal supply wells are located in the vicinity of the installation. Most wells are 1,000 to 2,000 feet deep and withdraw water from the Cambrian-Ordovician aquifer system. A few wells withdraw water from the shallow dolomite aquifer system. The approximate location of the wells that could be identified from the available data are shown on Figure 3.6. (Six water supply wells are not plotted on the figure; insufficient data were available to determine the location of the wells within the section.)

Some residential wells exist in the vicinity of the installation (R. T. Sasman, Illinois State Water Survey, oral communication, 1983). The closest well completed in the shallow dolomite is located approximately one and one-half miles east of the installation.

WATER QUALITY

Surface water quality is monitored in the Willow Creek watershed by personnel employed by the airport facility. (Landrum and Brown, 1983). The parameters monitored include biochemical oxygen demand (BOD), pH, suspended solids, total dissolved solids, fats, oil and grease, dissolved oxygen and hexane solubles. The locations of the monitoring sites (F, K and R) in the vicinity of the installation are shown on Figure 3.2 and the monitoring results for the period November 1981 to October 1982 are summarized in Table 3.4. Runoff from the installation is monitored at site K.

The results of water quality monitoring indicates that water discharging to the creek from the installation does not meet all NPDES/-Illinois Environmental Protection Agency (IEPA) standards. (Landrum and Brown, 1983). Suspended solids in the water generally exceeded standards and fats, oil and grease in the water have exceeded standards.

Water quality parameters in other surface waters nearby also exceed IEPA standards (Table 3.4). Discharge standards are generally exceeded in Willow Creek at site F above the confluence with the installation drainage ditch and at site R in a drainage ditch that discharges to

FIGURE 3.6

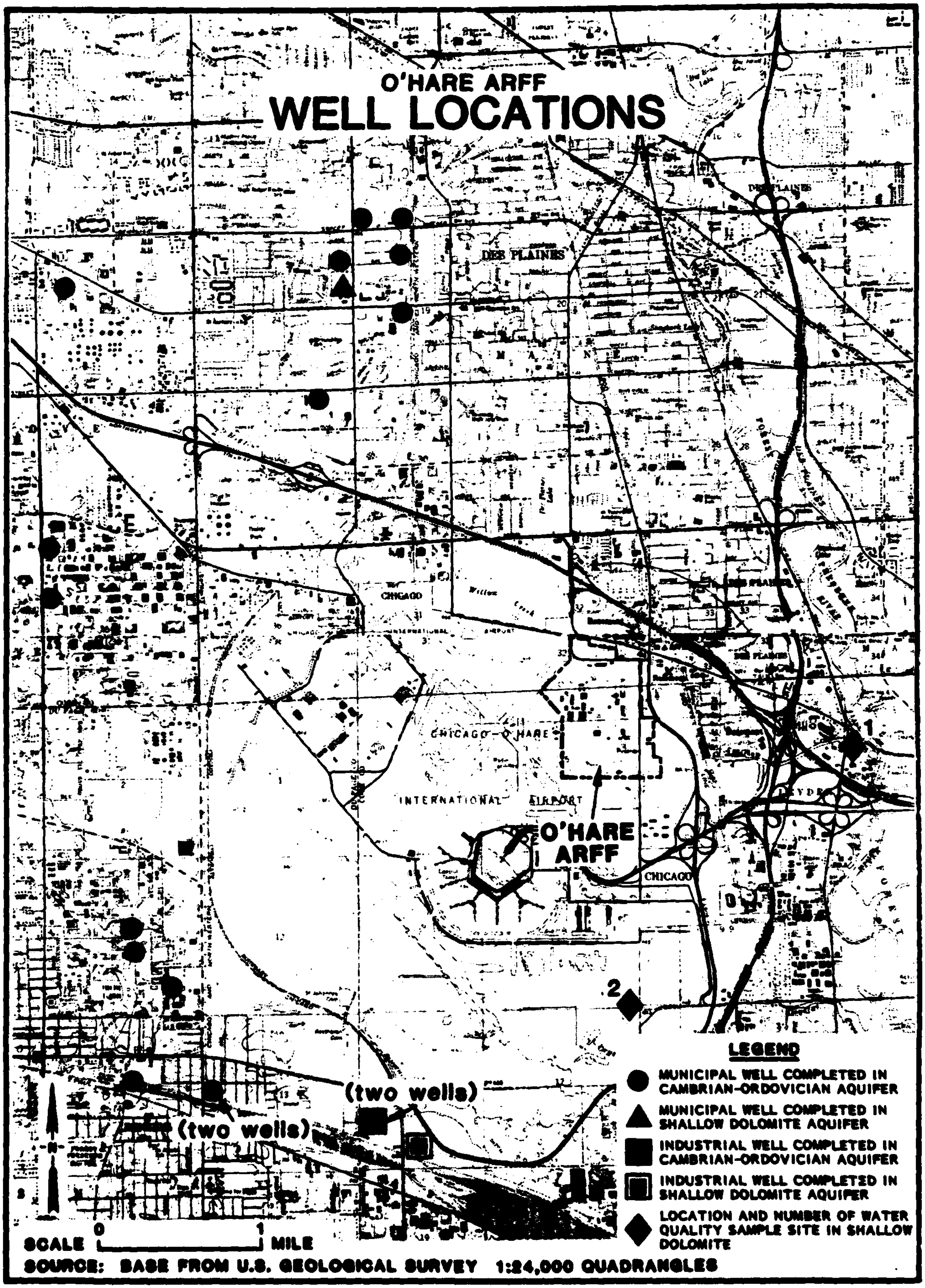

O'HARE ARFF
WELL LOCATIONS
DES PLAINES
CHICAGO-O'HARE
INTERNATIONAL AIRPORT
O'HARE
ARFF
CHICAGO
1
2
(two wells)
(two wells)
LEGEND
MUNICIPAL WELL COMPLETED IN CAMBRIAN-ORDOVICIAN AQUIFER
MUNICIPAL WELL COMPLETED IN SHALLOW DOLOMITE AQUIFER
INDUSTRIAL WELL COMPLETED IN CAMBRIAN-ORDOVICIAN AQUIFER
INDUSTRIAL WELL COMPLETED IN SHALLOW DOLOMITE AQUIFER
LOCATION AND NUMBER OF WATER QUALITY SAMPLE SITE IN SHALLOW DOLOMITE
N
SCALE 0 1 MILE
SOURCE: BASE FROM U.S. GEOLOGICAL SURVEY 1:24,000 QUADRANGLES

TABLE 3.4
SUMMARY OF SELECTED CHEMICAL ANALYSES FOR SURFACE WATERS
(Analyses in Milligrams Per Liter Unless Otherwise Noted)

Monitoring Site[3]	Time Period	BOD (30)[1]	pH (Std. Units) (6.0-9.0)[1]	Suspended Solids (15)[1]	Total Dissolved Solids (1'000)[2]	Fats, Oil and Grease (15)[1]	Dissolved Oxygen (5.0)[2]
F	Nov.1981-Dec.1981	A	-	X	A	-	-
	Jan.1982-Feb.1982	X	-	X	-	-	-
	Mar.1982-May 1982	X	-	X	X	X	-
	June 1981-Aug.1982	X	-	X	X	X	-
	Sept.1982-Oct.1982	-	-	X	X	X	-
K	Nov.1981-Dec.1981	-	-	X	-	-	-
	Jan.1982-Feb.1982	-	-	X	-	-	-
	Mar.1982-May1982	-	-	X	-	X	-
	June 1982-Aug.1982	-	-	X	-	X	-
	Sept.1982-Oct.1982	-	-	X	-	-	-
R	Nov.1981-Dec.1981	-	-	X	X	-	-
	Jan.1982-Feb.1982	B	-	X	X	-	-
	Mar.1982-May 1981	X	-	X	X	-	-
	June 1982-Aug.1982	-	-	X	X	-	-
	Sept.1982-Oct.1982	X	-	X	X	X	-

X Exceeded NPDES/IEPA Standards during period

\- Did not exceed NPDES/IEPA Standards during period

A Exceeded NPDES/IEPA Standards on one test date

B Exceeded NPDES/IEPA Standards on two test dates

1 Minimum effluent standard (IEPA, 1982)

2 General use stream water quality standard (IEPA, 1982)

3 See Figure 3.2

Source: Landrum and Brown, 1983

Willow Creek downstream from the installation drainage ditch. Poor water quality is typical of highly urbanized areas.

Water quality data for the shallow dolomite aquifer (Table 3.5) are available at two locations near the installation (Figure 3.6). One location is a residential supply well located approximately 1.5 miles east of the installation. The other location is a test well located approximately 1.5 miles south of the installation.

Water from the shallow dolomite is high in dissolved minerals (Table 3.5). The total dissolved solids content in the water is above recommended limits for public water supplies (USEPA, 1975). The iron content of the water is near the recommended upper limit.

The shallow dolomite well east of the installation (Figure 3.6, Well No. 1) shows signs of contamination. The chloride and sulfate contents in the water appear high and surfactants were detected in the water. Surfactants do not occur naturally in water. The contamination could result from any number of sources.

BIOTIC ENVIRONMENT

O'Hare ARFF has limited habitat available for wildlife. The installation consists mainly of cultivated lawns, building sites, and paved areas which offer negligible shelter for animals. Small tracts of unmowed brush and grass provide forage and cover for small mammals and birds. There are no threatened or endangered plant or animal species inhabiting the installation property. Four endangered animal species are known to inhabit the region (within 50 miles) and may occasionally visit the installation or airport. These are the Indiana bat, peregrine falcon, upland sandpiper, and marsh hawk. There is no indication that past installation activities have disrupted the patterns of these species.

SUMMARY OF ENVIRONMENTAL SETTING

The environmental setting data reviewed for this investigation identified the following major points that are relevant to O'Hare ARFF.

- o Net precipitation at the installation is 4.2 inches which indicates that there is some potential for leachate generation at

TABLE 3.5
SUMMARY OF SELECTED WATER QUALITY ANALYSES
FOR WATER FROM THE SHALLOW DOLOMITE AQUIFER
(Analyses in milligrams per liter)

Well No.[2]	Sulfate (250)[1]	Chloride (250)[1]	Total Dissolved Solids (500)[1]	Iron (0.3)[1]	Surfactants
1	160	220	1060	0.3	0.16
2	-	8	750	0.1	-

[1]Recommended drinking water standard (USEPA, 1975).
[2]Refer to Figure 3.6 for well locations.

hazardous waste sites and movement of contaminants in ground water. Rainfall intensity at the installation indicates that there is only a slight potential for erosion and transport of surface contamination from hazardcus waste sites. The one-year, 24 hour rainfall event used to gauge erosion and runoff potential was 2.4 inches.

- The permeability of the surficial unconsolidated deposits at the installation is on the order of 10^{-7} cm/sec which does not allow for rapid infiltration of water.
- Four aquifer systems exist at the installation. These aquifer systems are in descending order, the glacial drift aquifer, the shallow dolomite aquifer, the Cambrian-Ordovician aquifer system and the Mt. Simon aquifer.
- The upper glacial drift and shallow dolomite aquifers at the installation are hydraulically connected and are separated from the underlying Cambrian-Ordovician and Mt. Simon aquifers by the relatively impermeable Makoqueta Shale.
- Numerous wells are located in the vicinity of the installation. Industrial and municipal wells near the installation generally withdraw water from the Cambrian-Ordovician aquifer system. The one residential well and one test well identified from the available data withdraw water from the shallow dolomite aquifer. This water is high in dissolved solids and iron.
- Contamination of ground water may potentially occur at subsurface waste disposal sites on the installation. The glacial deposits are at least periodically saturated at depths as shallow as 5 feet below land surface.
- Surface runoff from the installation generally does not meet IEPA stream water quality standards, but is comparable to the water quality upstream in Willow Creek. This poor water quality is typical of highly urbanized areas.
- Portions of the north end of the installation are within the 100-year flood plan.
- No threatened or endangered plant or animal species inhabit the installation property.

SECTION 4
FINDINGS

To assess hazardous waste management at O'Hare Air Reserve Forces Facility (ARFF) at O'Hare International Airport, past activities of waste generation and disposal methods were reviewed. This section summarizes the hazardous waste generated by activity; describes waste disposal methods; identifies the disposal sites located on the base; and evaluates the potential for environmental contamination.

PAST SHOP AND INSTALLATION ACTIVITY REVIEW

A review was conducted of current and past Air Force activities at O'Hare ARFF with the objective of identifying those installation activities that generated hazardous waste. This review consisted of a search of files and records, interviews with installation employees, and site inspection.

The sources of hazardous wastes at O'Hare ARFF can be associated with any one of the activities listed below:

- o Industrial Shops
- o Fire Protection Training
- o Pesticide Utilization
- o Waste Storage Areas
- o Fuels Management

The following discussion addresses only those wastes generated on the installation which are either hazardous or potentially hazardous. Hazardous wastes are those wastes referenced by the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA, Public Law 96-510). A potentially hazardous waste is one which is suspected of being hazardous although insufficient data are available to fully characterize the waste material.

INDUSTRIAL OPERATIONS (SHOPS)

Since the O'Hare ARFF opened in 1946, the main function of the industrial operations (shops) on the installation has been to provide maintenance support activities to aircraft flying missions. Activities have included aircraft equipment maintenance, ground equipment maintenance, and installation facilities maintenance. A list of present industrial shops was obtained from the installation clinic files. Information contained in the files indicates if the shops handle hazardous materials and generate hazardous waste. A summary of the pertinent information from the shop files is presented in Appendix E, Master List of Industrial Shops.

For the shops known to generate hazardous wastes, interviews with personnel familiar with shop activities were conducted. The information obtained from interviews and installation records has been summarized in Table 4.1. For each generator of hazardous wastes, this table presents the shop location, waste materials generated, quantities of wastes generated, and a disposal method timeline. Many of the disposal methods were identified from information obtained from past and present personnel of O'Hare ARFF. The waste quantities shown in Table 4.1 are based on verbal estimates given by present shop personnel at the time of the interviews. The shops that have generated insignificant quantities or no hazardous waste are not listed in Table 4.1.

From 1943 to 1945 the area that is now O'Hare ARFF was a government-owned, contractor-operated plant (Douglas Aircraft Assembly Plant No. 8). Assembly operations typically do not generate significant amounts of hazardous solid waste. Most of the hazardous waste generated resulted from the painting operations. Several underground tanks stored paint thinners and fuels. All but one of these tanks (a fuel tank) have since been excavated and removed. Paper and other office materials were burned in an incinerator. Other wastes generated by this operation were disposed of in a manner that is not well defined. There are no records of any landfilling or other disposal operations during this period of time.

In the early years of installation operations, (1946 to 1955), an off-site contractor collected combustible liquid wastes (primarily waste oil) and removed them from the installation. From approximately 1955 to

TABLE 4.1

INDUSTRIAL OPERATIONS (Shops)

Waste Management

SHOP NAME	LOCATION (BLDG. NO.)	WASTE MATERIAL	WASTE QUANTITY	METHOD(S) OF TREATMENT, STORAGE & DISPOSAL 1940 1950 1960 1970 1980
AIR FORCE RESERVE, 928th TAG				
AIRCRAFT GROUND EQUIPMENT SHOP	33	PD-680	5 GALS./MO.	CON 1955 FT & CON 1979 CON
		BATTERY ACID	5 GALS./MO.	SAN NEUT, SAN
		WASTE OIL	50 GALS./MO.	CON FT & CON CON
BATTERY/ELECTRICAL SHOP	30	BATTERY ACID	2 GALS./MO.	SAN 1965 NEUT, SAN
		OLD BATTERIES	7 BATTERIES/YEAR	CON
CORROSION CONTROL	30	CLEANING SOLVENTS	10 GALS./MO.	CON & LF 1 1965 LF 2 1970 CON
		OLD SOLVENT CONTAINERS	<20 CANS/MO.	LF 1 LF 2 REF
		PAINT SKIMMINGS	<5 LBS./MO.	LF 1 LF 2 REF
ENGINE SHOP	30	PD-680	110 GALS./MO.	CON FT & CON CON
		WASTE SYNTHETIC OIL	5 GALS./MO.	CON FT & CON CON
		WASTE LUBE OIL	6 GALS./MO.	CON FT & CON CON
		HYDRAULIC FLUID	30 GALS./MO.	CON FT & CON CON
FIRE DEPARTMENT	63	ENGINE OIL	2 GALS./MO.	CON FT & CON CON
		HYDRAULIC FLUID	<1 GAL./YR.	CON FT & CON CON

KEY

——— CONFIRMED TIME-FRAME DATA BY SHOP PERSONNEL

- - - - - ESTIMATED TIME-FRAME DATA BY SHOP PERSONNEL

LEGEND

NEUT: NEUTRALIZED PRIOR TO DISPOSAL

LF 1: LANDFILL #1

LF 2: LANDFILL #2

CON: OFF-SITE SPECIAL CONTRACTOR

FT: FIRE TRAINING

SAN: SANITARY SEWER

REF: OFF-BASE REFUSE CONTRACTOR

TABLE 4.1 (CONT'D)

INDUSTRIAL OPERATIONS (Shops)

Waste Management

SHOP NAME	LOCATION (BLDG. NO.)	WASTE MATERIAL	WASTE QUANTITY	METHOD(S) OF TREATMENT, STORAGE & DISPOSAL (1940 – 1980)
AIR FORCE RESERVE, 928th THG (cont'd)				
FUEL CELL	35	PD-680	10 GALS./MO.	CON — FT & CON — CON
		JP-4	30 GALS./MO.	CON — FT & CON — CON
FUEL (POL) STORAGE	66	WASTE OIL	8 GALS./MO.	CON — FT & CON — CON
		CONTAMINATED JP-4	24 GALS./MO.	CON — FT & CON — CON
		CONTAMINATED DIESEL FUEL	25 GALS./MO.	CON — FT & CON — CON
MACHINE SHOP	30	WASTE LUBE OIL	<1 GAL./MO.	CON — FT & CON — CON
NON-DESTRUCTIVE INSPECTION SHOP	59	PHOTO CHEMICALS	<15 GALS./MO.	SAN
PNEUDRAULICS SHOP	30	HYDRAULIC FLUID	1 GAL./MO.	CON — FT & CON — CON
		PD-680	4 GALS./MO.	CON — FT & CON — CON
PROPULSION SHOP	34	PD-680	7 GALS./MO.	CON — FT & CON — CON
		HYDRAULIC FLUID	20 GALS./MO.	CON — FT & CON — CON
ROADS AND GROUNDS SHOP	55	EMPTY HERBICIDE CONTAINER	<3/MO.	LF 1 — LF 2 — REF
		ENGINE OIL	4 GALS./MO.	CON — FT & CON — CON
		HYDRAULIC FLUID	2 GALS./MO.	CON — FT & CON — CON
		KEROSENE	4 GALS./MO.	CON — FT & CON — CON

KEY

——— CONFIRMED TIME-FRAME DATA BY SHOP PERSONNEL

- - - - - - ESTIMATED TIME-FRAME DATA BY SHOP PERSONNEL

LEGEND

NEUT: NEUTRALIZED PRIOR TO DISPOSAL
LF 1: LANDFILL #1
LF 2: LANDFILL #2
CON: OFF-SITE SPECIAL CONTRACTOR
FT: FIRE TRAINING
SAN. SANITARY SEWER
REF: OFF-BASE REFUSE CONTRACTOR

TABLE 4.1 (CONT'D)

INDUSTRIAL OPERATIONS (Shops)

Waste Management

SHOP NAME	LOCATION (BLDG. NO.)	WASTE MATERIAL	WASTE QUANTITY	METHOD(S) OF TREATMENT, STORAGE & DISPOSAL 1940 1950 1960 1970 1980
AIR FORCE RESERVE, 928th TAG (cont'd)				
VEHICLE MAINTENANCE FACILITY	50	BATTERY ACID	10 GALS./MO.	SAN 1965 NEUT, SAN
		OLD BATTERIES	1 BATTERY/MO.	CON
		HYDRAULIC FLUID	5 GALS./MO.	CON FT & CON CON
		ENGINE WASTE OIL	80 GALS./MO.	CON FT & CON CON
		PD-680	10 GALS./MO.	CON FT & CON CON
		ANTIFREEZE	20 GALS./MO.	SAN CON
ILLINOIS AIR NATIONAL GUARD				
AIRCRAFT GROUND EQUIPMENT SHOP	24	PD-680	10 GALS./MO.	CON FT & CON CON
		WASTE OIL	30 GALS./MO.	CON FT & CON CON
VEHICLE MAINTENANCE SHOP	5	WASTE OIL	20 GALS./MO.	CON FT & CON CON
		PD-680	10 GALS./MO.	CON FT & CON CON
ENGINE SHOP	70	PD-680	15 GALS./MO.	CON 1955 FT & CON 1979 CON
		WASTE OIL	35 GALS./MO.	CON FT & CON CON
REPAIR AND RECLAMATION SHOP	30	PD-680	10 GALS./MO.	CON 1955 FT & CON 1979 CON
		JP-4	<10 GAL./MO.	CON FT & CON CON
		PAINT REMOVER	<2 GALS./MO.	CON & LF 1 1965 LF 2 1970 CON

KEY

——— CONFIRMED TIME-FRAME DATA BY SHOP PERSONNEL

- - - - - ESTIMATED TIME-FRAME DATA BY SHOP PERSONNEL

LEGEND

NEUT: NEUTRALIZED PRIOR TO DISPOSAL

LF 1: LANDFILL #1

LF 2: LANDFILL #2

CON: OFF-SITE SPECIAL CONTRACTOR

FT: FIRE TRAINING

SAN: SANITARY SEWER

REF: OFF-BASE REFUSE CONTRACTOR

TABLE 4.1 (CONT'D)

INDUSTRIAL OPERATIONS (Shops)

Waste Management

SHOP NAME	LOCATION (BLDG. NO.)	WASTE MATERIAL	WASTE QUANTITY	METHOD(S) OF TREATMENT, STORAGE & DISPOSAL 1940 1950 1960 1970 1980
ILLINOIS AIR NATIONAL GUARD (cont'd)				
VEHICLE MAINTENANCE FACILITY	12	BATTERY ACID	5 GALS./MO.	SAN — NEUT, SAN
		OLD BATTERIES	<1 BATTERY/MO.	CON
		HYDRAULIC FLUID	5 GALS./MO.	CON — FT & CON — CON
		WASTE OIL	50 GALS./MO.	CON — FT & CON — CON

KEY

———— CONFIRMED TIME-FRAME DATA BY SHOP PERSONNEL

------ ESTIMATED TIME-FRAME DATA BY SHOP PERSONNEL

LEGEND

NEUT: NEUTRALIZED PRIOR TO DISPOSAL
LF 1: LANDFILL #1
LF2: LANDFILL # 2
CON: OFFSITE SPECIAL CONTRACTOR
FT: FIRE TRAINING
SAN: SANITARY SEWER
REF: OFF-BASE REFUSE CONTRACTOR

1979, combustible wastes were burned at the Fire Protection Training Areas (see following discussion). Presently these wastes are drummed and stored for outside contract disposal.

Cleaning solvents and related wastes were sometimes removed by the off-site contractor in the early years. At other times, the solvent-type wastes were drummed and disposed of in one of the two installation landfills.

Solids waste generated by shop operations, along with the rest of the installation's general rubbish, was disposed of in the installation landfills through 1970, when landfilling operations ceased. Since then it has been removed from the installation by a contract-disposal company.

Fire Protection Training

Since 1955, fire protection training exercises have been conducted by the Air Force at three locations. Only one of these was located on what is now installation property (Figure 4.1). Prior to 1955, it is uncertain what, if any, fire protection training was done.

Fire Protection Training Area

From approximately 1955 to the early 1960's, the Air Force fire department conducted fire training exercises in an area on the southeast side of the installation. The burn pit was constructed with an earth berm and a natural soil bottom. AVGAS, MOGAS, waste oil and combustible liquids were burned here. It is unknown whether there was any water presoaking, or how frequently training was practiced or what extinguishing agents were used. No visual evidence of the site was present during the site visit since the area is now covered by a hardfill area.

Other Fire Protection Training Areas

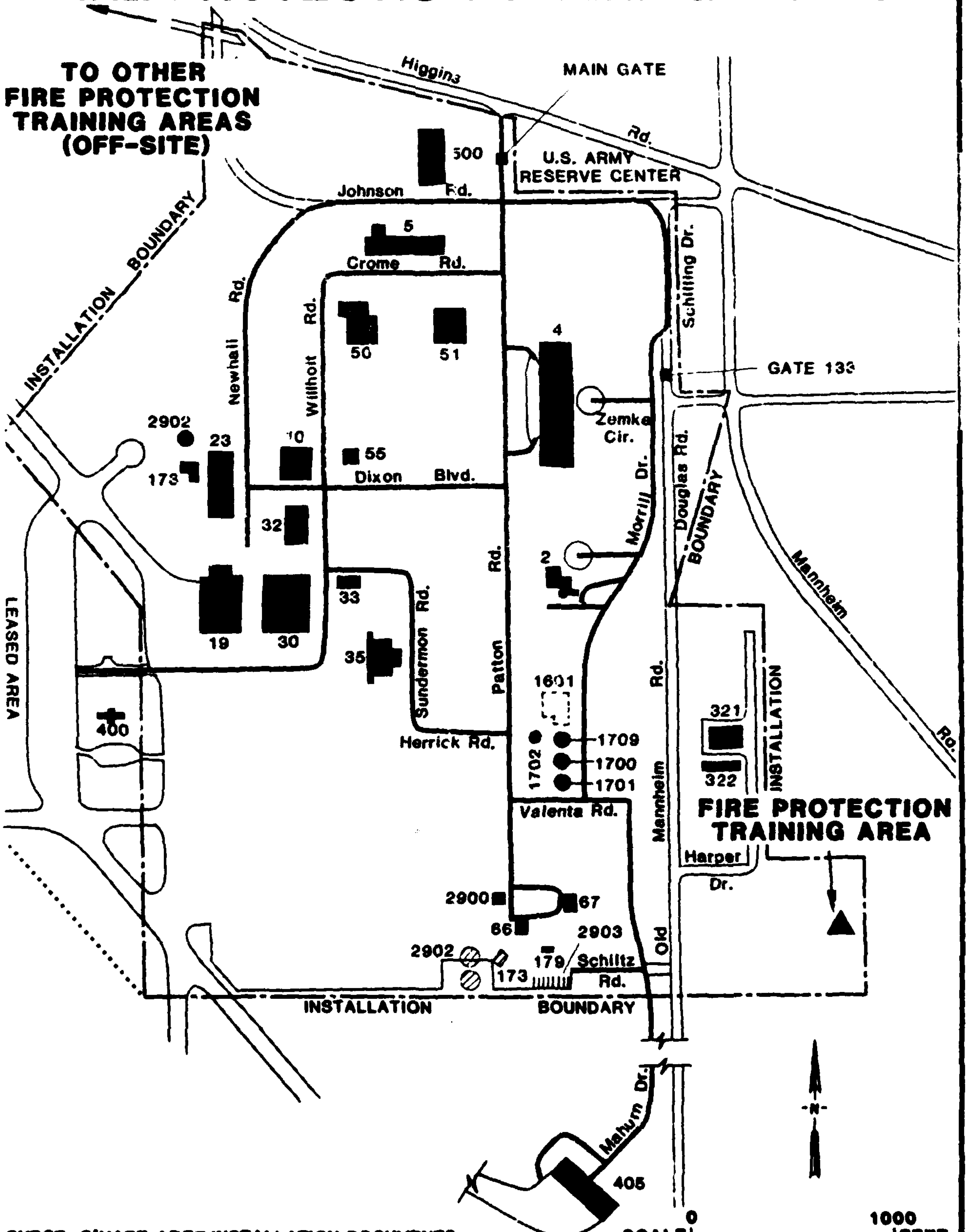
From the early 1960's through the present day, fire training exercises have taken place at two sites on O'Hare International Airport property under a joint training agreement. One Fire Protection Training Facility was located just north of Old Higgins Road. The current Fire Protection Training Facility is located approximately one mile south of the second site.

Pesticide Utilization

Pesticide applications have been conducted by the Roads and Grounds Shop and O'Hare ARFF throughout the history of the installation. Currently, shop personnel apply 2-Prometon (an amine herbicide) annually

FIGURE 4.1

O'HARE ARFF
FIRE PROTECTION TRAINING AREAS



SOURCE: O'HARE ARFF INSTALLATION DOCUMENTS

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throughout the installation for general weed control. All of the pesticide material prepared is used up in the application process. No other pesticides or herbicides were reported as being used. Containers are rinsed and disposed of as general refuse.

Waste Storage Areas

Presently, waste chemicals and used oils at O'Hare ARFF are accumulated at the site of generation until removed to a central storage area. This storage area is located in a depressed area at the south end of the Old Assembly Plant foundation, a former truck loading area (Figure 4.2). The area is open to the weather and access is not controlled. The soil in this storage area was darker than normal, indicating that past spills had occurred.

Drums of waste from the hangers are accumulated on an outside concrete wash rack area adjacent to the buildings (Figure 4.2). The area is located over a drain grill that discharges to either the surface drainage system or the sanitary sewer system. During aircraft washing operations, the drain is directed to the sanitary sewer via a nearby, underground oil/water separator. Otherwise, the drain feeds the storm sewer system. The discharge direction is selected by moving a vane located underneath the grill. The concrete is stained indicating that spills and/or leaks have occurred.

Fuels Management

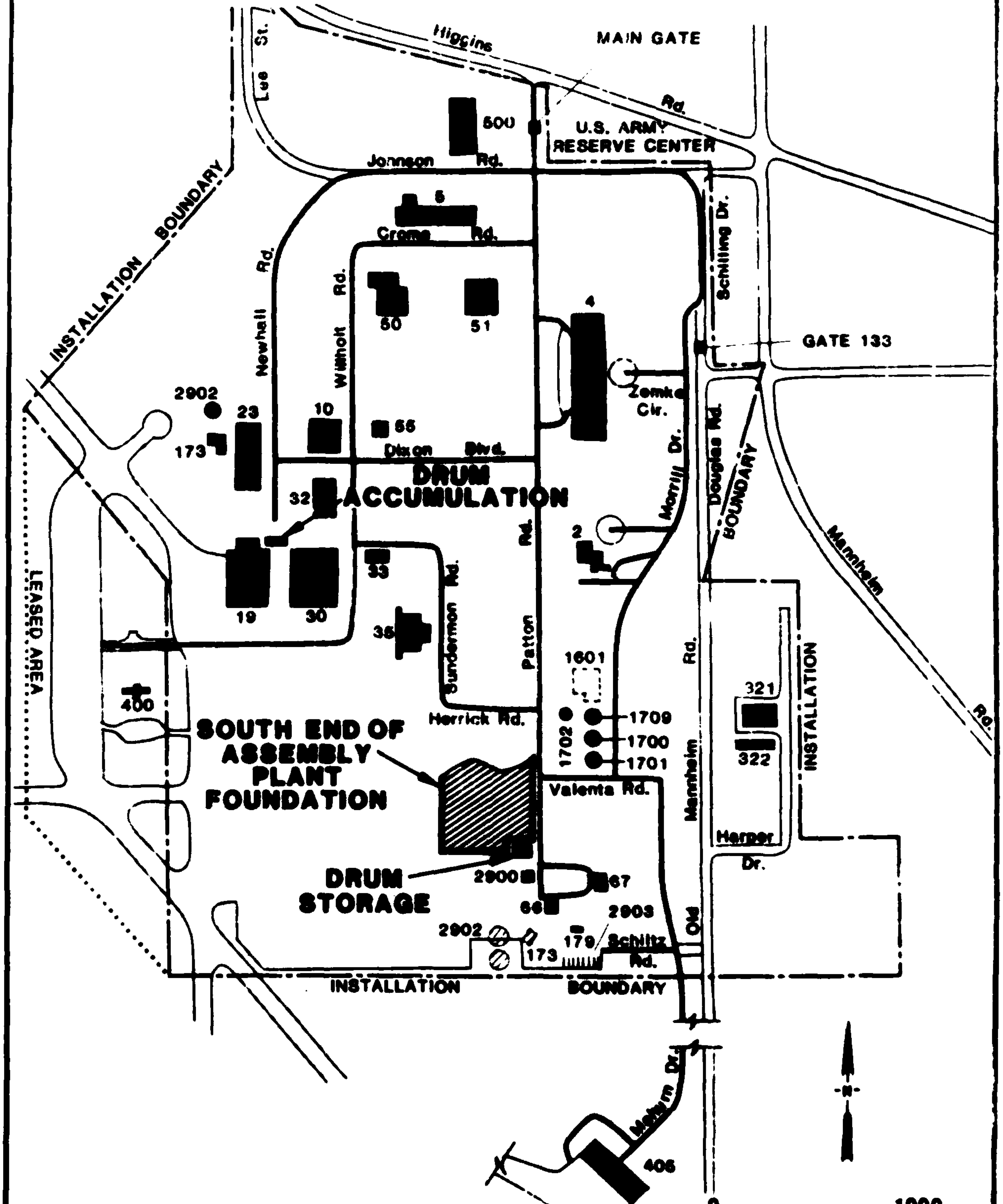
The O'Hare ARFF Fuels Management storage system consists of fifteen above ground and below ground tanks in two areas (west POL and south POL areas). A listing of the locations of the fuel storage tanks and their contents and capacities has been provided in Appendix D. Fuels stored at O'Hare ARFF include: JP-4, MOGAS, FS-5 and FS-2 (No. 2 Fuel Oil). Fuels are currently delivered to the installation by tank truck. In the past, fuel has been delivered to the west and south POL areas by railcar as well.

JP-4 is stored in the west POL storage area in one above ground 210,000 gallon tank and two under ground 50,000 gallon tanks. The aboveground tank is equipped with secondary containment in the form of an earth dike over an asphaltic material. The diked areas are checked daily, with water accumulations discharged to the surface drainage system. A hydrant network was previously used to fuel aircraft on the

FIGURE 4.2

O'HARE ARFF

HAZARDOUS WASTE DRUM ACCUMULATION AND STORAGE SITES



SOURCE: O'HARE ARFF INSTALLATION DOCUMENTS

SCALE 0 1000 FEET

west aircraft apron. This network was shut down in the early 1970's for replacement. Currently fuel leaves the area through the new hydrant system and in tank trucks. The South POL area has nine 25,000 gallon and two 11,500 gallon above ground JP-4 tanks. It also has has one 25,000 gallon above ground tank which has been partitioned in two, with one half holding 12,500 gallons of FS-2 and the other half nearly empty. At one time, this other half held engine oil. Fuel is removed from this area for use by tank truck only.

Spills and Leaks

Small fuel spills have occurred in several areas throughout the installation. The spills are generally attributed to fuel transfer and aircraft refueling operations. They typically occur on paved areas and evaporate or are cleaned up. No significant environmental contamination is attributed to these spills.

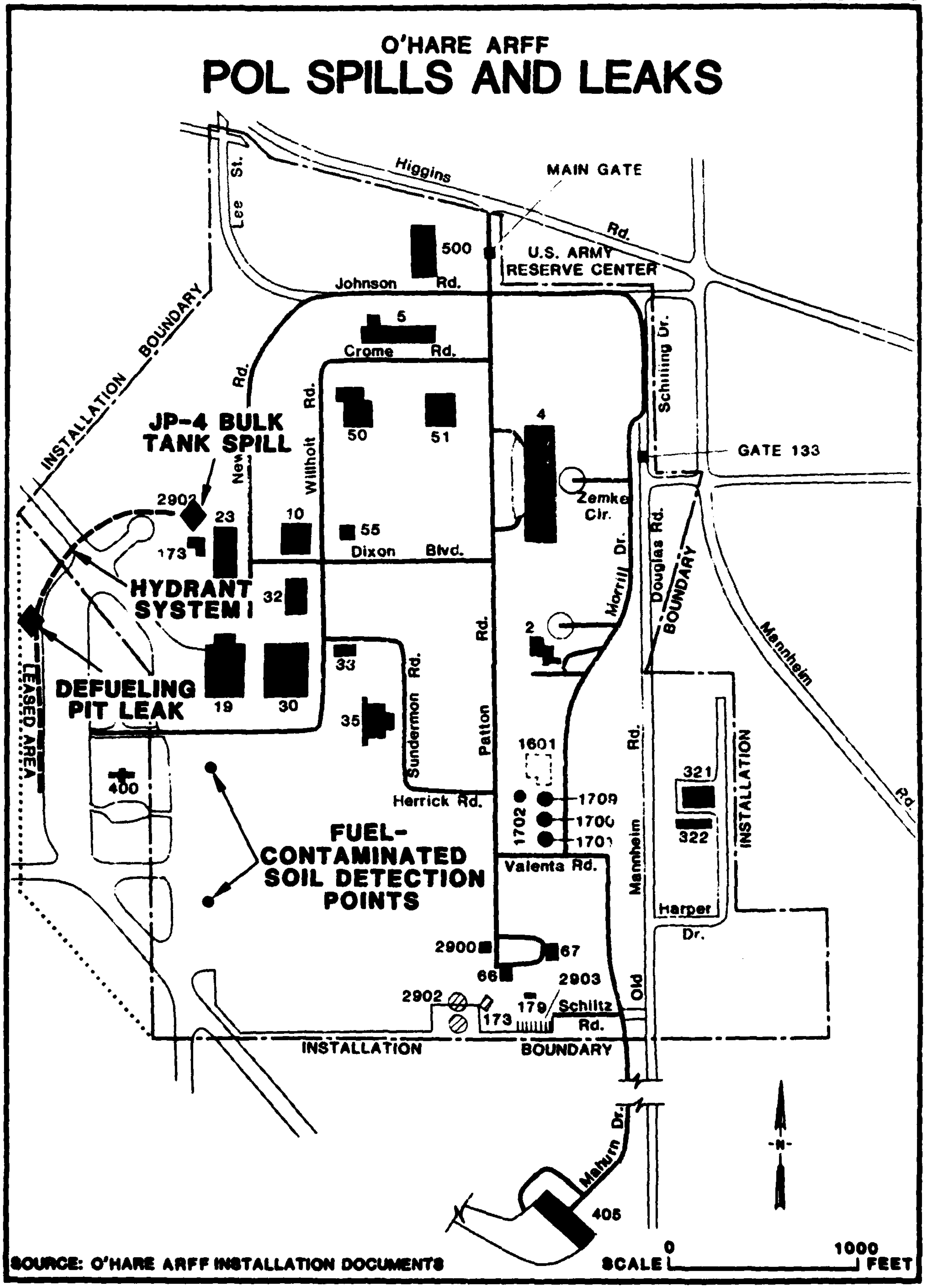
A major spill occurred in January 1972 at the aboveground JP-4 tank in the West POL area (Figure 4.3). The dike accumulated water from exceptionally heavy rains. A rapid change of weather then froze the water causing it to crush the external piping to the tank. This resulted in 82,000 gallons of fuel being released within the dike. About 40,000 gallons of fuel were recovered and the remaining fuel either infiltrated into the ground or evaporated.

Another spill occurred when a 12,000 gallon defueling pit along the old hydrant network (Figure 4.3) cracked due to external pressure exerted on it during a winter freeze in the late 1960's. The leak was discovered later when water began to appear in the fuel passing through this tank. The amount of JP-4 lost is not known. The tank has been removed and replaced.

During an Airfield Pavement Evaluation in 1977, fuel-contaminated soil was discovered beneath the main apron at two points (Figure 4.3). The soil was described as "saturated with jet fuel." No source for this contamination was immediately identifiable, although the underground hydrant system has had leaks before, and a preliminary evaluation suggests that it is upgradient of the contamination.

There is an abandoned underground MOGAS tank located on the south edge of the installation. This tank dates from the 1940's and was used at least through the early 1960's. No records could be found to

FIGURE 4.3



SOURCE: O'HARE ARFF INSTALLATION DOCUMENTS

describe the tank, and no information regarding tank closure could be established.

A ground disposal site at the Vehicle Maintenance Facility (Bldg. 5) (Figure 4.4) was reported to be the location for regular dumping of motor oil until the mid 1970's. No evidence of this action was observed during the site visit since the area behind the building has been covered over by a concrete vehicle parking lot. The contaminated soil may have been removed during construction of the parking lot.

During the 1950's and 1960's the area south of the south apron was used as an occasional dumping area for small quantities of liquid wastes from the shops (Figure 4.4). The material would flow into a storm water drainage ditch which ran parallel to the edge about ten feet away and be washed away from the site. Due to the irregular frequency and small quantity of dumpings, this area was not listed as a "disposal method" in Table 4.1, Industrial Operations. No evidence of environmental stress could be found here during the site visit.

DESCRIPTION OF PAST ON-INSTALLATION DISPOSAL METHODS

The facilities at O'Hare ARFF which have been used for the management and disposal of waste can be categorized as follows:

- o Landfills
- o Hardfills
- o Storm Drainage System
- o Sanitary Sewer System
- o Low Level Radioactive Disposal Area

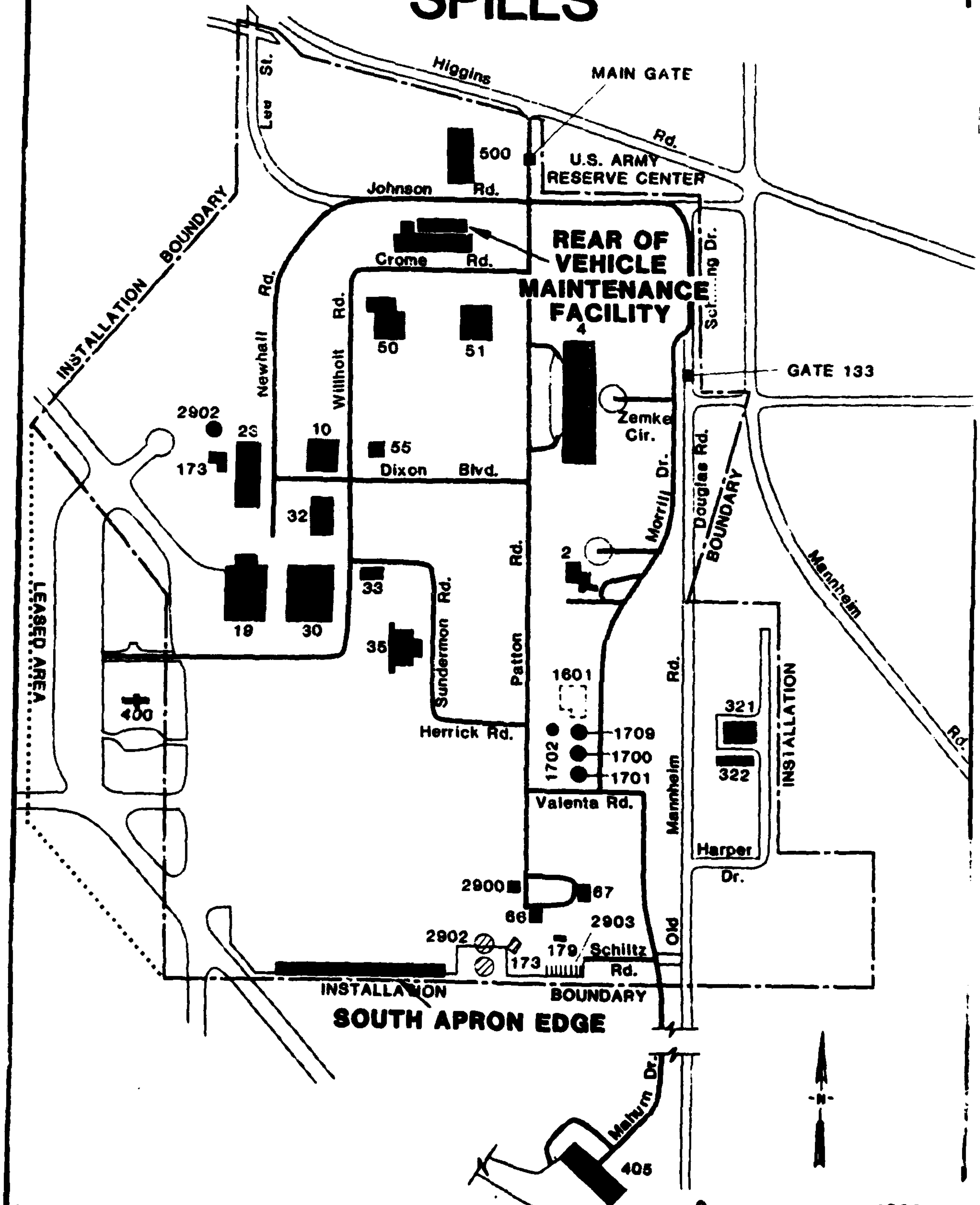
Landfills

Two landfill operations were identified at O'Hare ARFF. These two landfills are discussed below.

Landfill No. 1 (1953-1965)

Landfill No. 1 was operated from 1953-1965. It was located on the northwest side of the installation, along Newhall/Lee Street and Higgins (Figure 4.5). During the early operation, trash was filled in a slightly depressed area. Trench and fill operations became the standard operating procedure after a few years. The trenches were excavated

O'HARE ARFF
SPILLS

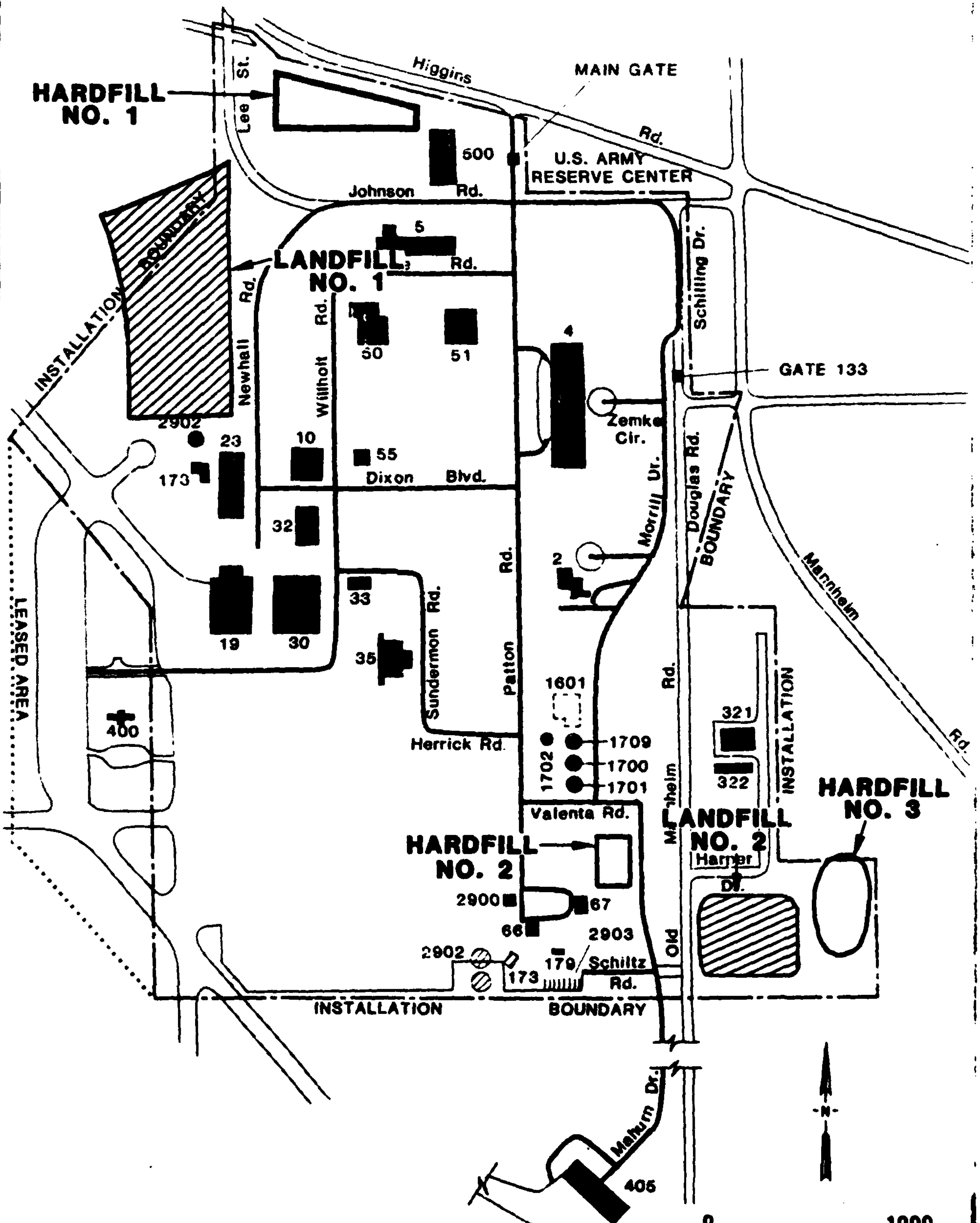


SOURCE: O'HARE ARFF INSTALLATION DOCUMENTS

SCALE 0 1000 FEET

FIGURE 4.5

O'HARE ARFF
LANDFILLS AND HARDFILLS



SOURCE: O'HARE ARFF INSTALLATION DOCUMENTS

about 10 feet deep. The landfill received at least some portion of all wastes generated on the installation, including general refuse and office trash, old aircraft part, old kitchen-type appliances and both new and old tools. It was also reported that some drummed waste from the shop operations went into this landfill. There was occasional burning at this landfill. The operation ceased in 1965 when the airport runways were expanded. The site is closed and has an earth cover. Holes dug by burrowing animals indicate that the landfill is close to the present surface of the ground in the area.

Landfill No. 2 (1965-1972)

When Landfill No. 1 was closed, the landfill operation was moved to southeast portion of the installation (Figure 4.5). Landfill No. 2 was operated from 1965 through 1972. This landfill was operated in two adjacent areas and was almost exclusively a trench and fill operation. Part of Landfill No. 2 is located outside the O'Hare ARFF. The trenches were about 10 feet deep. It continued to receive the same type of wastes as disposed of at Landfill No. 1. Drums of shop wastes were crushed and buried with earth-moving equipment. There was no burning of waste at this site. The landfill is closed and has an earth cover.

Hardfills

Three hardfill sites were identified on O'Hare ARFF (Figure 4.5). Hardfill No. 1 was operated during the early period of installation operations. It received only construction materials. Hardfill No. 2 was operated during 1965 and received miscellaneous non-hazardous rubble from the demolition at the old Assembly Plant Building. The site is closed and is covered with soil. Hardfill No. 3, located by Landfill No. 2 has received concrete rubble since 1965 and is still open. Hardfill No. 3 is located over the old Fire Protection Training Area.

Storm Drainage System

The installation storm drainage system collects water runoff from the civilian airport and the Air Force installation at O'Hare and conveys it through both wooden and concrete pipes to an open drainage ditch off of the installation property. This ditch in turn discharges to Willow Creek. Although no shop wastes or other hazardous materials were regularly disposed of to this system, intermittant spills have occasionally entered the pipes. A number of the wooden pipe sections have

collapsed, indicating that any materials which have entered the system have probably been in direct contact with the ground around it.

Sanitary Sewer System

There is no treatment of sanitary wastewater on the base. Since the beginning of the operation of the Douglas Aircraft Assembly Plant through to the present day the network of sanitary sewer piping has been connected to the City of Chicago Sanitary District System. Typically shop wastes and other hazardous materials do not enter the sanitary sewer, with the exception of neutralized battery acid and photochemicals.

Low-level Radiation Disposal Site

The low-level radiation disposal sites is located northeast of the south POL tank farm (Figure 4.6). The site was used for disposal of low-level radioactive vacuum tubes. The site was operated during the 1950's and 1960's and closed in the late 1960's. The waste material was placed in a pit about eight feet deep and then covered with earth. There is no marking or fence at this site.

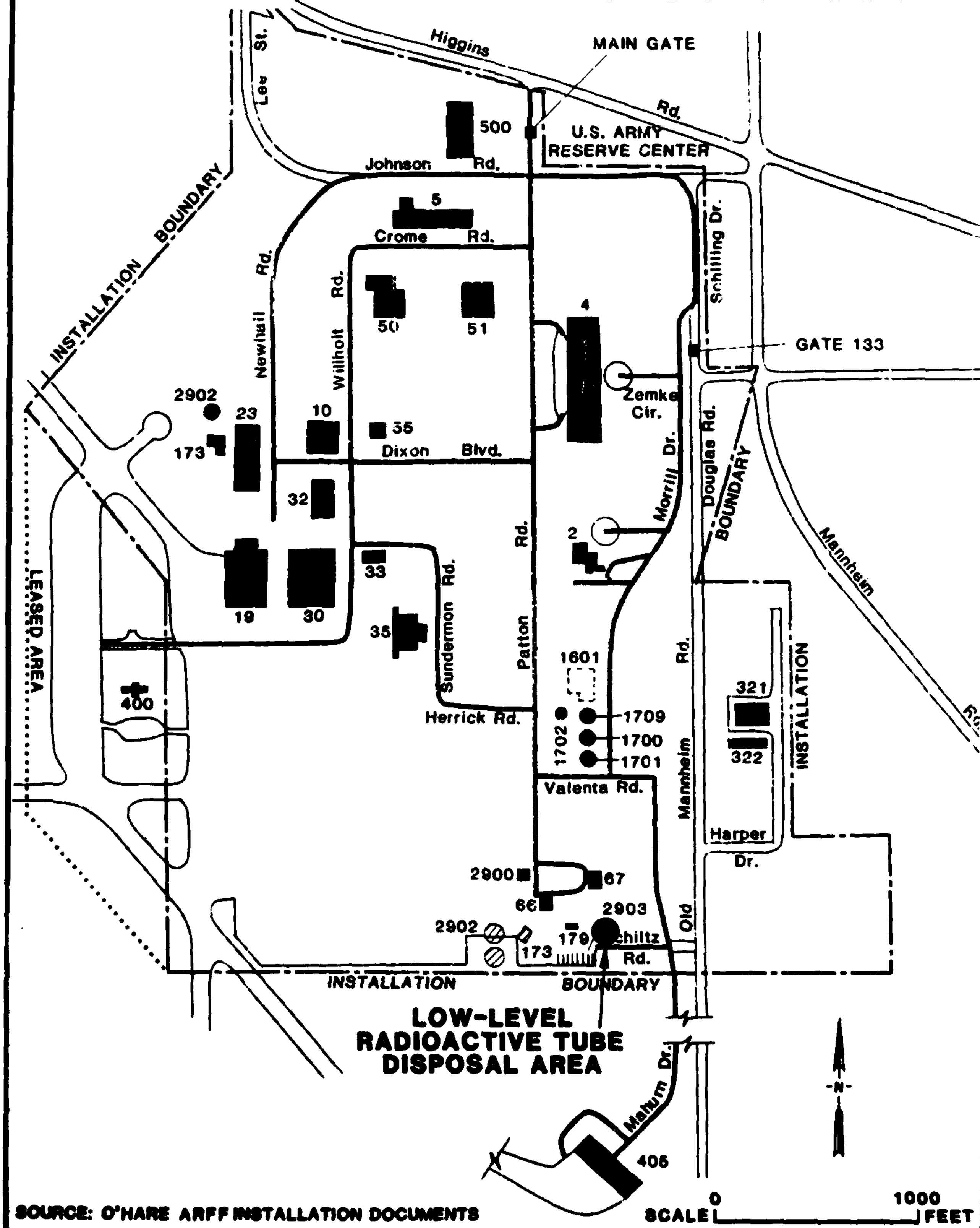
EVALUATION OF PAST DISPOSAL ACTIVITIES AND FACILITIES

The review of past operation and maintenance functions and past waste management practices at O'Hare ARFF has resulted in the identification of 16 sites which were initially considered as areas of concern with regard to the potential for contamination, as well as the potential for the migration of contaminants. These sites were evaluated using the Decision Tree Methodology shown in Figure 1.1. Those sites which were considered as not having a potential for contamination were deleted from further consideration. Those sites which were considered as having a potential for the occurrence of contamination and migration of contaminants were further evaluated using the Hazard Assessment Rating Methodology (HARM) (Appendix H). Table 4.2 identifies the decision tree logic used for each of the areas of intitial concern.

Based on the decision tree logic, five of the 16 sites originally reviewed did not warrant evaluation using the Hazard Assessment Rating Methodology. The rationale for omitting these five sites from HARM evaluation is discussed below.

FIGURE 4.6

O'HARE ARFF
LOW-LEVEL RADIOACTIVE TUBE DISPOSAL AREA



SOURCE: O'HARE ARFF INSTALLATION DOCUMENTS

TABLE 4.2
SUMMARY OF DECISION TREE LOGIC FOR AREAS OF INITIAL ENVIRONMENTAL CONCERN AT O'HARE ARFF

Site Description	Potential for Contamination	Potential For Contaminant Migration	Other Environmental Concern	HARM Rating
Landfill No. 1	YES	YES	N/A	YES
Landfill No. 2	YES	YES	N/A	YES
JP-4 Tank Spill Site	YES	YES	N/A	YES
Defueling Pit Leak Site	YES	YES	N/A	YES
Fire Protection Training Area	YES	YES	N/A	YES
Storm Drainage System in the Hangar Area	YES	YES	N/A	YES
Hazardous Waste Drum Accumulation Point	YES	NO	YES	NO
Hazardous Waste Storage Area	YES	YES	N/A	YES
South Edge of Apron	YES	YES	N/A	YES
Vehicle Maintenance Facility	YES	YES	N/A	YES
Low Level Radioactive Disposal Site	YES	YES	N/A	YES
Hardfill No.1	NO	NO	NO	NO
Hardfill No. 2	NO	NO	NO	NO
Hardfill No. 3	NO	NO	NO	NO
Buried Tanks from the Douglas Operation (1942-1945)	NO	NO	YES	NO
Fuel-Contaminated Soil Under Main Apron	YES	YES	N/A	YES

Hardfill No. 1 was used for the disposal of construction rubble only. This material is nonhazardous and would not cause any environmental contamination.

Hardfill No. 2 was used for the disposal of building debris during the demolition of the old Assembly Plant Building and received only wood, concrete, glass and some plumbing piping. This material is nonhazardous and hence would not cause any environmental contamination.

Hardfill No. 3 is used for the disposal of concrete and stone rubble and as such, would not cause any environmental contamination.

Several underground tanks stored paint thinners and fuels for the Douglas Aircraft Co. during the 1940's. All but one of these tanks have since been excavated and removed. No reports were found of any leaks or spills from these tanks and hence, the site poses no potential for contamination of the environment.

The Hazardous Waste Drum Accumulation Point is located over a large concrete pad. In the event of a spill, the wastes would not run off onto the earth. Instead they would either stay where they were spilled or they would enter the installation's storm sewer system. (The storm sewer system is rated using the HARM method.) Hence, no potential for environmental contamination exists at this site itself.

The remaining 11 sites identified on Table 4.2 were evaluated using the Hazard Assessment Rating Methodology. The HARM process takes into account characteristics of potential receptors, waste characteristics, pathways for migration, and specific characeristics of the site related to waste management practices. The details of the rating results are summarized in Table 4.3. The HARM system is designed to be one of the many indicators of the relative need for follow-on action. The information presented in Table 4.3 is intended for assigning priorities for further evaluation of the O'Hare ARFF disposal areas (Section 5, Conclusions and Section 6, Recommendations). The rating forms for the individual waste disposal sites at O'Hare ARFF are presented in Appendix H. Photographs of some of the disposal sites are included in Appendix F.

TABLE 4.3
SUMMARY OF HARM SCORES FOR POTENTIAL CONTAMINATION SOURCES
O'HARE ARFF

Rank	Site Name	Receptor Subscore	Waste Characteristics Subscore	Pathways Subscore	Waste Management Factor	Overall Total Score
1	Landfill No. 1	57	90	67	0.95	68
2	JP-4 Tank, West POL Area	57	80	67	0.95	65
3	Fuel-Contaminated Soil	57	54	80	1.00	64
4	Defueling Pit Leak Site	57	64	67	1.00	63
5	Fire Protection Training Area	57	64	67	0.95	60
6	Hazardous Waste Storage Area	57	60	67	0.95	58
7	Landfill No. 2	57	50	67	0.95	55
8	Storm Drainage System	57	36	67	1.00	53
9	South Edge of Apron	57	32	67	1.00	52
10	Vehicle Maintenance Facility	57	24	67	1.00	49
11	Low Level Radioactive Disposal Site	57	15	67	0.95	44

SECTION 5

CONCLUSIONS

The goal of the IRP Phase I Study is to identify sites where there is the potential for environmental contamination resulting from past waste disposal practices and to assess the probability of contaminant migration from these sites. The conclusions given below are based on the assessment of the information collected from the project team's field inspection, review of records and files, review of the environmental setting, and interviews with installation personnel, past employees, and state and local government employees. Table 5.1 contains a list of the potential contamination sources identified at O'Hare ARFF and a summary of the HARM scores for those sites. The sites themselves are discussed below.

LANDFILL NO. 1

Landfill No. 1 has a sufficient potential to create environmental contamination and follow-on investigation is warranted. The landfill was operated between 1953 and the mid 1960's and received various wastes generated on the installation, including general refuse and office trash, old aircraft parts, and drums containing shop wastes. The shop wastes were probably spent solvents, waste oils and sludges. There was occasional burning at this landfill and the waste is buried to a depth of about 10 feet. The water table is high and ground-water is very likely in contact with the wastes. The site received a HARM score of 68.

JP-4 SPILL SITE

The JP-4 Tank spill site has a sufficient potential to create environmental contamination and follow-on investigation is warranted. In 1972, an 82,000 gallon spill of JP-4 occurred at the west POL area. The spill was contained inside the dike area and 40,000 gallons of JP-4 was

TABLE 5.1

PRIORITY RANKING OF POTENTIAL CONTAMINATION SOURCES

Rank	Site Name	Dates of Operation Or Occurrence	Overall HARM Score
1	Landfill No. 1	1953-1960's	68
2	JP-4 Tank, West POL Area	January 1972	65
3	Fuel-Contaminated Soil	1977	64
4	Defueling Pit Leak Site	Late 1960's	63
5	Fire Protection Training Facility	1955-early 1960's	60
6	Hazardous Waste Storage Area	1981-Present	58
7	Landfill No. 2	1965-early 1970's	55
8	Storm Drainage System	1942-Present	53
9	South Edge of Concrete Apron	Prior to 1970	52
10	Vehicle Maintenance Facility, Rear	Prior to 1977	49
11	Low Level Radioactive Disposal Site	Prior to 1970	44

recovered. The remaining estimated 42,000 gallons of JP-4 either evaporated or infiltrated into the ground. The water table is high in this area and the fuel likely contacted the water table in the upper glacial drift. The site received a HARM score of 65.

FUEL-CONTAMINATED SOIL

The fuel-contaminated soil under the main apron indicates that there is a sufficient potential created for environmental contamination and follow-on investigation is warranted. When discovered in 1977, the soil was described as "saturated with jet fuel." The site received a HARM score of 64.

DEFUELING PIT LEAK

The defueling pit leak site has a sufficient potential to create environmental contamination and follow-on investigation is warranted. This 12,000 gallon underground tank developed a leak which was present for an undetermined period of time prior to its discovery in the late 1960's, when water appeared in the fuel passing through this tank. The amount of JP-4 lost is not known. The site received a HARM score of 63.

FIRE PROTECTION TRAINING AREA

Fire Protection Training Area has a sufficient potential to create environmental contamination and follow-on investigation is warranted. From approximately 1955 to the early 1960's, the installation fire department conducted fire training exercises in an area on the southeast side of the installation. The burn pit was constructed with a soil bottom and an earth berm around it. Contaminated fuels (AVGAS, MOGAS) and combustible liquid wastes were burned during fire protection training exercises. The site is now covered by a hardfill. This site received a HARM score of 60.

HAZARDOUS WASTE STORAGE AREA

The Hazardous Waste Storage Area has a sufficient potential to create environmental contamination and follow-on investigation is warranted. This storage area is located in a depressed area at the south end of the Old Assembly Plant foundation (a former truck loading

area). The soil in this storage area was darker than normal, indicating that past spills have occurred. This site received a HARM score of 58.

LANDFILL NO. 2

Landfill No. 2 has a sufficent potential to create environmental contamination and follow-on investigation is warranted. This landfill was in operation from the mid 1960's through 1972 and was operated in two adjacent areas in a trench and fill manner. A portion of this landfill is located outside of O'Hare ARFF property. Trenches were about 10 feet deep. It received general refuse, office trash and some shop wastes. Some drums of shop wastes were crushed with earth moving equipment. There was no burning of waste at this site. The landfill is closed and covered. The water table is high and ground water is very likely in contact with the wastes. The site received a HARM score of 55.

STORM DRAINAGE SYSTEM NEAR HANGARS

The Storm Drainage System in the Aircraft hangar area has a sufficient potential to create environmental contamination and follow-on investigation is warranted. The system in this area has probably received shop wastes from the hangars. Also, liquid hazardous wastes are accumulated in an area which drains directly into this wood- and concrete-pipe system. The system received a HARM score of 53.

SOUTH EDGE OF APRON

The south edge of the main concrete apron has a sufficient potential to create environmental contamination and follow-on investigation is warranted. This area was occasionally used as a dumping area for small quantities of liquid wastes from the shops in the 1950's and 1960's. A stormwater drainage ditch runs parallel to the edge, about ten feet away. During the site visit, no environmental stress was observed in this area. The site received a HARM score of 52.

VEHICLE MAINTENANCE FACILITY

The rear of the vehicle maintenance facility has an insufficient potential to create environmental contamination and no follow-on

investigation is warranted. Motor oil was dumped on the ground north of Building No. 5 from the early 1950's until about 1975. The area behind the building has been covered over by a concrete vehicle parking lot. The contaminated soil may have been removed when the parking lot was built. The site received a HARM score of 49.

LOW-LEVEL RADIOACTIVE DISPOSAL SITE

The low-level radioactive disposal site has an insufficient potential to create environmental contamination and no follow-on investigation is warranted. This area was used for the disposal of vacuum tubes during the 1950's and the 1960's. The site received a HARM score of 44.

SECTION 6

RECOMMENDATIONS

Eleven sites were identified at O'Hare ARFF as having the potential for environmental contamination and have been evaluated using the HARM system. This evaluation assessed their relative potential for environmental contamination and along with relevant site specific information identified those sites where further study and monitoring may be necessary. Nine of the sites were determined to have sufficient evidence to indicate the potential for environmental contamination. Additional data concerning these sites will be required in order to clearly ascertain whether or not these sites have contributed environmental contamination. Therefore, the following recommendations have been developed for each of the nine sites. There was insufficient evidence on the other two sites to warrant further investigation.

PHASE II MONITORING RECOMMENDATIONS

The following recommendations are made to further assess the potential for environmental contamination from waste disposal areas at O'Hare ARFF. The recommended actions are generally one-time sampling programs to determine if contamination does exist at the site. If contamination is identified, the sampling program may need to be expanded to further define the extent of contamination.

Geophysical surveys, consisting of electrical resistivity, electromagnetic and/or magnetometer techniques, are recommended prior to any well installations to attempt to delineate the horizontal and vertical extent of the site, subsurface leachate plumes migrating from the site, and subsurface stratigraphy including the hardpan formation. The alternative approach to geophysical testing would be the conventional technique to test well drilling and ground-water sampling. The cost benefit

of geophysical surveys over test drilling can be understood by comparisons of time, cost and data availability. Table 6.1 presents general guidelines for the use of certain geophysical techniques.

The recommended monitoring program for Phase II is summarized in Table 6.2.

1) Landfill No. 1 has a sufficient potential to create environmental contamination and monitoring of this site is recommended. A geophysical survey should be conducted to define the landfill boundaries and depth, and identify any leachate plume. Based on the results of the geophysical survey, one upgradient and 3 downgradient monitoring wells should be installed. Wells should be constructed using 3" Schedule 40 PVC, screened into the first sand and gravel lens (20' to 30' deep). Sample these wells and analyze for pH, total dissolved solids, total organic halogen, total organic carbon, oil and grease, and phenol.

2) The JP-4 Tank Dike Spill Site has a sufficient potential to create environmental contamination and further monitoring of this site is recommended. A geophysical survey should be conducted around the tank farm to identify any JP-4 plume. Conduct a continuous core sampling in the dike area extended to the first sand and gravel lens and observe if any JP-4 is present. Then perform a water extract on 3 soil samples and analyze for oil and grease, and total organic carbon.

3) The Fuel-contaminated Soil area indicates that there is a sufficient potential to create environmental contamination and further monitoring of this site is recommended. A geophysical survey should be conducted around the area to define the extent of the fuel plume and to locate its source, if possible. Conduct a continuous core sampling as near to the sites as possible, extended to the first sand and gravel lens (20' to 30' deep) and observe if any JP-4 is present. Then perform a water extract on 3 soil samples and analyze for oil and grease and total organic carbon. If a

TABLE 6.1

GENERAL GUIDELINES FOR USE OF CERTAIN GEOPHYSICAL TECHNIQUES AT HAZARDOUS WASTE SITES

Geophysical Technique	[1]Limiting Factors		[2]Best Usage Areas	Advantages	Disadvantages
	Surface	Subsurface			
Surface Electrical Resistivity	Asphalt/concrete areas; ponded water.	Pipelines, electrical lines & other conductors; buried containers; most solidifed wastes; highly variable geology; mineralized ground water.	Open field; no surface or subsurface constraints; homogeneous geology.	Vertical & horizontal anomalies identifiable; sounding depth can be relatively accurate; depth range of 300 feet with least expensive equipment.	2- to 3-man operation; relatively time consuming; probes must be placed into soil.
Electromagnetic	Overhead electric lines; structures nearby.	Pipelines, electrical lines & other conductors; buried containers; most solidified wastes; highly variable geology; mineralized ground water.	Open field; no surface or subsurface constraints; homogeneous geology.	One-man operation; relatively quick; no contact with soil.	Depth range 18 feet with least expensive equipment.
Magnetometer	Overhead electric lines; structures nearby.	Pipelines, electrical lines & other conductors; buried containers; most solidified wastes; highly variable geology; mineralized ground water; ferromagnetic bedrock underlying site.	Open field; no surface or subsurface constraints; homogeneous geology; waste containers made from ferromagnetic metal and isolated in pits or trenches.	Horizontal limits of ferromagnetic metal drums and ferromagnetic solid wastes easily identifiable; one-man operation; no contact with soil; depth to target can be estimated.	Only useful to locate ferromagnetic metal targets.

Notes: 1. Technique ineffective if these factors are present at site; data interpretations difficult.
2. Data interpretations relatively uncomplicated if geology is known.

Sources: Breiner, 1973; EPA, 1978; Zohdy and others, 1974.

TABLE 6.2
RECOMMENDED MONITORING PROGRAM FOR PHASE II
O'HARE ARFF

Ranking Number	Site Name	Rating Score	Recommended Monitoring	Comments
1	Landfill No. 1	68	Conduct geophysical survey to define the landfill boundaries and depth and identify any leachate plume. Based on the results of the geophysical survey, install one upgradient and 3 down-gradient monitoring wells. Wells should be constructed using 3" Schedule 40 PVC, screened into the first sand and gravel lens (20' to 30' deep). Sample these wells and analyze for pH, TDS, TOX, TOC, and phenol.	Continue monitoring if sampling indicates contamination. Addition wells may be needed.
2	JP-4 Tank Dike Spill	65	Conduct geophysical survey around the tank farm to identify any JP-4 plume. Conduct a continuous core sampling in the dike area extended to the first sand and gravel lens. Observe if any JP-4 is present. Perform a water extract on 3 soil samples and analyze for oil and grease and TOC.	Conduct combined geophysical survey with Landfill No. 1.
3	Fuel-Contaminated Soil	64	Conduct geophysical survey around the site to identify any JP-4 plume. Conduct a continuous core sampling near the site extended to the first sand and gravel lens (20'-30' deep). Observe if any JP-4 is present. Perform a water extract on 3 soils samples and analyze for oil and greas, and TOC.	Coordinate geophysical survey with other site work. If plume is identified locate boring in plume near tank. Monitoring wells may be required if plume identified.
4	Defueling Pit Leak Site	63	Conduct geophysical survey around the site to identify any JP-4 plume. Conduct a continuous core sampling near the site extended to the first sand and gravel lens (20'-30' deep). Observe if any JP-4 is present. Perform a water extract on 3 soil samples and analyze for oil and grease, and TOC.	Coordinate geophysical survey with other site work. If plume is identified locate boring in plume near tank. Monitoring wells may be required if plume identified.
5	Fire Protection Training Area	60	Conduct geophysical survey around the site to identify any leachate plume.	The site is covered by a hardfill; therefore, site monitoring is restricted.
6	Hazardous Waste Storage Area	58	Conduct a continuous core sampling in the center of the site extended to the first sand and gravel lens (20'-30' deep). Observe if contamination present. Perform a water extract of 3 selected soil samples (in contaminated zones if present) and perform analyses for pH, TOX and TOC.	If contamination found, install monitoring well to better characterize contaminants in the ground water.
7	Landfill No. 2	55	Conduct geophysical survey to define the landfill boundaries and depth and identify any leachate plume. Based on the results of the geophysical survey, install one upgradient and two downgradient monitoring wells. Wells should be constructed of 3" Schedule 40 PVC, screened into the first sand and gravel lens (20'-30' deep). Sample these wells and analyze for pH, TOC, TOX, TDS and phenols.	Conduct combined geophysical survey with the Fire Protection Training Area. Continue monitoring if sampling indicates contamination.
8	Storm Drainage System Near Hangars	53	Conduct continuous core sample at the nearest wooden pipe section and at the nearest outfall extended to the first sand and gravel lens. Observe if contamination is present. Perform a water extraction of 3 samples and analyze for TOX, TOC and pH.	If contamination is found, collect and analyze samples from any water standing in the system. Another series of core sampling may be necessary to define the extent of contamination.
9	Spills along South Edge of Main Apron	52	Conduct a continuous core sampling at the edge of the apron extended to the first sand and gravel lens (20'-30' deep). Observe if any contamination present. Perform a water extract on 3 selected soil samples (in contaminated zones if present) and perform analyses for pH, TOX and TOC.	If contamination found in the core samples, collect and analyze surface water and sediment samples in the drainage ditch during high flow period.

plume was identified during the survey, the boring should be located to intercept the plume. Monitoring wells may be required if a plume is identified.

4) The Defueling Pit Leak Site has a sufficient potential to create environmental contamination and further monitoring of the site is recommended. A geophysical survey should be conducted around the site to identify any JP-4 plume. Conduct a continuous core sampling by the site extended to the first sand and gravel lens (20' to 30' deep) and observe if any JP-4 is present. Then perform a water extract on 3 selected soil samples (in the contaminated zone, if present) and analyze for oil and grease, and total organic carbon. If a plume was identified during the survey, the boring should be located to intercept the plume. Monitoring wells may be required if a plume is identified.

5) The Fire Protection Training Area has a sufficient potential to create environmental contamination and further monitoring of the site is recommended. A geophysical survey should be conducted to identify any leachate plume. Further investigation of the site is to be coordinated with that of Landfill No. 2, discussed below.

6) The Hazardous Waste Storage Area has a sufficient potential to create environmental contamination and further monitoring of the site is recommended. Any old drums in the area should be located and examined. Conduct a continuous core sampling in the center of the site extended to the first sand and gravel lens (20' to 30' deep) and observe if contamination present. Perform a water extract of 3 selected soil samples (in contaminated zones if present) and analyze for pH, total organic halogen and total organic carbon.

7) Landfill No. 2 has a sufficient potential to create environmental contamination and further monitoring of the site is recommended. First conduct a geophysical survey (simultaneous with the Fire Protection Training Area, above) to define the landfill boundaries and depth, and identify any leachate plume. Based on the results

of the geophysical survey, install one upgradient and two downgradient monitoring wells. Wells should be constructed of 3" Schedule 40 PVC, screened into the first sand and gravel lens (20' to 30' deep). Sample these wells and analyze for pH, total organic carbon, total organic halogen, total dissolved solids and phenols.

8) The Storm Drainage System in the aircraft hangar area has a sufficient potential to create environmental contamination and further monitoring of the system is recommended. First, the sections which are wooden pipe nearest the hangars should be identified. The nearest outfall should also be identified. Then conduct a continuous core sampling at each point extended to the first sand and gravel lens (20' to 30' deep) and observe if any contamination is present. Perform a water extract on 3 selected soil samples from each point and perform analyses for total organic halogen, total organic carbon, and pH. If contamination is found in either core sample, collect and analyze water samples from any water found standing in the system. Another series of core samples may be necessary to define the extent of any contamination.

9) The Spill Area along the South Edge of the Main Apron has a sufficient potential to create environmental contamination and further monitoring of the site is recommended. First, conduct a continuous core sampling at the edge of the apron extended to the first sand and gravel lens (20' to 30' deep) and observe if any contamination is present. Perform a water extract on 3 selected soil samples in contamination zones if present) and perform analyses for pH, total organic halogen and total organic carbon. If contamination is found in the core samples, collect and analyze surface water and sediment samples in the drainage ditch during a high flow period.

OTHER RECOMMENDATIONS

The following items did not warrant HARM ratings but are significant to the protection of the environmental at O'Hare ARFF. It is recommended that the installation environmental program incorporate these recommendations into its overall plan.

1) The oil/water separator located near Building No. 19 (both the main tank and its overflow tank) should be emptied and it should be verified that the water overflows into the sanitary sewer. Regular monitoring and periodic emptying of this separator is recommended.

2) The location of Hazardous Waste Accumulation Point near the aircraft hangars should be reevaluated in light of the possibility of a spill entering the storm sewer.

3) The abandoned MOGAS tank(s) at the south edge of the Main Apron should be checked for any contents and either removed or filled with sand.

4) A sign should be permanently posted at the low-level radioactive disposal site identifying it as such.

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APPENDICES

APPENDIX A

BIOGRAPHICAL DATA

Biographical Data

DAVID L. GREGORY

Environmental Engineer

Personal Information

Date of Birth: 1 April 1953

Education

B.S. in Civil Engineering, 1976, University of Cincinnati, Ohio
M.E. in Environmental Systems Engineering, 1978, Clemson University, South Carolina

Professional Affiliations

Engineer-in-Training (Ohio)
Georgia Water Pollution Control Association
Water Pollution Control Federation

Honorary Affiliations

Chi Epsilon

Experience Record

1974-1975	State of Ohio, Department of Transportation, Lebanon, Ohio. Construction Inspector. Responsibilities included inspection of soil work and concrete structures for interstate highway I-471.
1976-1978	Clemson University, Clemson, South Carolina. Graduate Research Assistant (1976-1977). Conducted bench-scale treatability studies on an organic dye manufacturer's wastewater to determine the effects of ozone pretreatment on the kinetics of activated sludge.
	Graduate Research Associate (1978). Served as research coordinator and treatment technologist for bench-scale treatability studies of organic dye manufacturing wastewater by ozonation, hyperfiltration, carbon absorption, activated sludge, and powdered activated carbon (PAC) processes. Performed analyses for toxic compounds using atomic absorption and gas chromatography.
1979-1981	GMP Associates, Inc., Honolulu, Hawaii. Project Engineer. Responsible for sampling, data evaluation, review of operating procedures, and development of design and operating modifications for a study on pollution potential of the naval drydock facilities at

David L. Gregory (Continued)

Pearl Harbor. Involved in a series of troubleshooting studies at municipal wastewater treatment plants which included collection and evaluation of performance data on pump stations, clarifiers, activated sludge units, trickling filters, aerobic and anaerobic digesters, and various dewatering devices and recommendations for improving plant performance through design and operational modifications.

Project Manager. Supervised a study on the source and control of hydrogen sulfide odors at a municipal treatment plant, involving investigation of the wastewater collection system and the treatment plant, an extensive wastewater characterization program, evaluation of ozonation, carbon absorption, and catalytic reduction treatment processes, and recommendation for alternative processes and operating strategies.

1981-Date Engineering-Science. Project Engineer. Developed stormwater control strategies, wastewater treatment design criteria, and a computer model for predicting the hydraulic impact of stormwater flows on the treatment system for an oil refinery NPDES permitting project. Conducted batch and continuous bench scale biological treatability studies on a wastewater stream containing 2,4-D, organic arsenic, and other herbicides, which included extensive wastewater characterization, jar testing of metal salt for arsenic precipitation, ammonia stripping testing, primary settling column testing, and development of a computer model to determine the alkalinity and distribution of carbonate and ammonia species in the wastestream under various conditions of pH and carbonate concentration. Involved in a waste compatability study, design of spill prevention and control features, and determination of health and safety requirements for a photographic lab chemical storage area and a hazardous waste collection system.

Project Manager. In charge of developing a comprehensive Spill Prevention Control and Countermeasure (SPCC) guidance manual and pollution contingency plans for U.S. Air Force bases which involved compliance with hazardous waste regulations and development of procedures for evaluating existing spill prevention and response capabilities. Directed a bioreactor treatability study to evaluate loading rates, PAC addition, and organics removal for the design of the wastewater treatment facilities at a plastics plant to be constructed by General Electric in The Netherlands.

David L. Gregory (Continued)

Papers and Presentations

"Biological Treatability of an Ozonated Dye Manufacture Waste," Master of Engineering Special Problem Report, Clemson University, Environmental Systems Engineering Department, Clemson, South Carolina, 1979.

Biographical Data

H. DAN HARMAN, JR.
Hydrogeologist

Personal Information

Date of Birth: 7 December 1948

Education

B.S., Geology, 1970, University of Tennessee, Knoxville, TN

Professional Affiliations

Registered Professional Geologist (Georgia NO.569)
National Water Well Association (Certified Water Well Driller No. 2664)
Georgia Ground-Water Association

Experience Record

1975-1977 Northwest Florida Water Management District, Havana, Florida. Hydrogeologist. Responsible for borehole geophysical logger operation and log interpretation. Also reviewed permit applications for new water wells.

1977-1978 Dixie Well Boring Company, Inc., LaGrange, Georgia. Hydrogeologist/Well Driller. Responsible for borehole geophysical logger operation and log interpretation. Also conducted earth resistivity surveys in Georgia and Alabama Piedmont Provinces for locations of water-bearing fractures. Additional responsibilities included drilling with mud and air rotary drilling rigs as well as bucket auger rigs.

1978-1980 Law Engineering Testing Company, Inc., Marietta, Georgia. Hydrogeologist. Responsible for ground-water resource evaluations and hydrogeological field operations for government and industrial clients. A major responsibility was as the Mississippi Field Hydrologist during the installation of both fresh and saline water wells for a regional aquifer evaluation related to the possible storage of high level radioactive waste in the Gulf Coast Salt Domes.

1980-1982 Ecology and Environment, Inc., Decatur, Georgia. Hydrogeologist. Responsible for project management of hydrogeological and geophysical investigations at uncontrolled hazardous waste sites. Also prepared Emergency Action Plans and Remedial Approach Plans for U.S. Environmental Protection Agency. Additional

H. Dan Harman, Jr. (Continued)

responsibilities included use of the MITRE hazardous ranking system to rank sites on the National Superfund List.

1982-1983 NUS Corporation, Tucker, Georgia. Hydrogeologist. Responsible for project management of hydrogeological and geophysical investigations at uncontrolled hazardous waste sites.

1983-Date Engineering-Science, Inc., Atlanta, Georgia. Hydrogeologist. Responsible for hydrogeological evaluations during Phase I Installation Restoration Program projects for the Department of Defense.

Publications and Presentations

"Geophysical Well Logging: An Aid in Georgia Ground-Water Projects," 1977, coauthor: D. Watson, The Georgia Operator, Georgia Water and Pollution Control Association.

"Use of Surface Geophysical Methods Prior to Monitor Well Drilling," 1981. Presented to Fifth Southeastern Ground-Water Conference, Americus, Georgia.

"Cost-Effective Preliminary Leachate Monitoring at an Uncontrolled Hazardous Waste Site," 1982, coauthor: S. Hitchcock. Presented to Third National Conference on Management of Uncontrolled Hazardous Waste Sites, Washington, D.C.

"Application of Geophysical Techniques as a Site Screening Procedure at Hazardous Waste Sites," 1983, coauthor: S. Hitchcock. Proceedings of the Third National Symposion and Exposition on Aquifer Restoration and Ground-Water Monitoring, Columbus, Ohio.

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Biographical Data

ROBERT J. REIMER

Chemical Engineer

Personal Information

Date of Birth: 12 April 1956

Education

B.S. in Chemical Engineering, 1979, University of Notre Dame
B.A. in Art, 1979, University of Notre Dame
M.S. in Chemical Engineering, 1980, University of Notre Dame

Honors

Amoco Company Fellowship for Graduate Studies in Chemical Engineering, University of Notre Dame (1979-1980)

Professional Affiliations

American Institute of Chemical Engineers

Experience Record

1978-1979 PEDCo Environmental, Cincinnati. Engineer's Assistant. Responsible for compilation of data base report reviewing solid waste disposal in the nonferrous smelting industry. Participated in SO_2 scrubber emissions testing program, Columbus, Ohio. Worked on team establishing a computerized reference file on the overall smelting industry. Performed technical editing and report review.

1979-1980 Camargo Associates, Ltd., Cincinnati. Design Engineer and Draftsman. Responsible for HVAC design on numerous projects. Designed fire protection system for an industrial plastics press. Designer on various general plumbing jobs. Prepared EPA air pollution permit applications.

1980-Date Engineering-Science. Chemical Engineer. Responsible for the preparation of environmental reports and permit documents as well as providing general environmental assistance to clients to assure compliance with state and federal regulations.

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Robert J. Reimer (Continued)

1980-Date Developed cost estimates for several hazardous waste management facility closures. Prepared several Interim Status Standards Manuals, including Manifest Plans, Waste Analysis Plans, Closure Plans and Contingency/ Emergency Plans. Provided technical assistance in the design of a one-million gallon per year fuel alcohol production facility.

Provided assistance for a water reuse/reduction plan at a major petroleum refinery. Conducted an extensive review of emerging energy technologies for the Department of Energy. Participated in several Installation Restoration Programs for the U. S. Air Force. Assisted in the design of a contaminated ground water air stripping column based on a lab model to be developed. Prepared several delisting petitions for the removal of industrial wastestreams from EPA's hazardous waste list. Assisted in a study of waste oil reuse for the U.S. Army CERL.

APPENDIX B

LIST OF INTERVIEWEES

APPENDIX B
LIST OF INTERVIEWEES

O'Hare ARFF

	Position	Years of Service
1.	Environmental Coordinator, Civil Engineering Squadron	3
2.	Civilian Supervisor, Consolidated Aircraft Maintenance Squadron	38
3.	Fire Chief, Fire Department	9
4.	Supervisor Fuels Management	22
5.	Vehicle Maintenance	24
6.	TAG Clinic	5
7.	Civil Engineering Squadron	37
8.	Supervisor, Fuel Maintenance	13
9.	Supervisor, Vehicle Maintenance	37
10.	Civil Engineering Squadron	36
11.	Civil Engineering Squadron	37
12.	ILANG	6
13.	Heavy Equipment Operator, Civil Engineering Squadron	14
14.	Fuels Maintenance	4
15.	Base Supply	32
16.	Aircraft Maintenance Squadron	28
17.	Chief Engineer, Civil Engineering Squadron	3
18.	Supervisor, Aircraft Maintenance Squadron	33
19.	Supervisor, Material and Equipment Inspector	27

	Position	Years of Service
20.	Fire Chief (Ret.), Fire Department	24
21.	Supervisor, Ground Safety	34
22.	Supervisor, Aircraft Maintenance	34
23.	Supervisor, Electric Shop, Civil Engineering Squadron	33
24.	Aircraft Maintenance	30
25.	Command Post	23
26.	Base Civil Engineer, Civil Engineering Squadron	21

OUTSIDE AGENCIES

Illinois EPA

Jack Barnetts	Emergency Response	
Eva Howard	Envir. Services Division	312/886-6233
Don Clopke	Water Pollution Sec.	312/345-9780

USEPA

John Oaks	Superfund Office	312/886-6156
Gale Hrufka	Waste Management Sec.	312/886-6138

City of Chicago

Bob Valiquet	Department of Aviation	312/686-2268

Illinois Dept. of Energy and Natural Resources
State Water Survey Division

Robert Sasman	Hydrologist	312/879-6466

Illinois Dept. of Conservation

Mike Sweet	Geologist	217/782-6424

APPENDIX C

ORGANIZATIONS AND MISSIONS

APPENDIX C
ORGANIZATIONS AND MISSIONS

PRIMARY ORGANIZATION AND MISSION

The primary mission of the 928th Tactical Air Group is to provide individual and unit training in the C-130A, tactical airlift support for airborne forces, equipment, supplies and aeromedical evacuation within the theater of operations. The Group also operates and maintains the Air Force complex at O'Hare International Airport, represents the Air Force in the Chicago metropolitan area, and provides support to various tenant units.

TENANT ORGANIZATIONS AND MISSIONS

The O'Hare Air Reserve Forces Facility is host to several tenant organizations and provides facilities, services and other support to these organizations. The following list identifies the major tenant organizations and briefly describes their missions.

126th Air Refueling Wing, Illinois Air National Guard (Ill ANG)

The primary mission is to provide ground and aerial refueling, using Boeing KC-135, and to maintain maximum combat readiness at minimum cost. Other missions include fly-in ground servicing, personnel transport, emergency air evacuation, and cargo transport. The Wing advises and assists State authorities in the administration, logistics, training and operation of the military air forces. The Wing also participates in joint exercises and maneuvers, and provides disaster relief in domestic emergencies.

264th Mobile Communicatons Squadron, Ill ANG

The primary mission of the Squadron is the installation, operation and maintenance of radio relays and mobile radio relay terminals at unprepared sites, including VHF or UHF/FM microwave and topospheric scatter equipment. The Squadron is also responsible for the installation, operation, and maintenance of radio communications tributary teams, including telephone, teletype and communications center functions.

217th Electronics Installation Squadron, Ill ANG

The Squadron is responsible for installation and maintenance of ground communication-electronics equipment. The squadron consists of four ground radio communications equipment teams, two telephone switching teams, eight outside wire and antenna systems teams and sixteen cable splicing teams.

36th Medical Service Evacuation Squadron

This Squadron trains to fulfill its wartime mission of providing aeromedical staging at fixed medical facilities or other designated locations.

USAF Liaison Office/National Scouting Organization

This office administers the USAF program of cooperation with the Boy Scouts of America. The office acts as liaison between Air Force installations and scouts within Boy Scout Region VII (Illinois, Indiana, Michigan, Wisconsin and eastern Iowa).

Additional Tenants

Defense Contract Administration Services Region

Defense Logistics Agency

Headquarters, Ill ANG

126th Combat Support Group, Ill ANG

126th Consolidated Aircraft Maintenance Squadron, Ill ANG

126th USAF Clinic, Ill ANG

126th Civil Engineering Flight, Ill ANG

566th USAF Band, Ill ANG

Aeronautical Systems Division, Reserve Detachment (AFLC)

Corps of Engineers Field Office

APPENDIX D

POL TANK INFORMATION

APPENDIX D

POL TANK INFORMATION

Location (Facility No)	Product	Volume (Gal)	Comment
2900	Diesel	60,000	
2900	MOGAS (unleaded)	10,000	
2900	MOGAS (regular)	10,000	
2902 (170)	JP-4	210,000	
2902 (171)	JP-4	50,000	Underground
2902 (172)	JP-4	50,000	Underground
2903	JP-4	25,000	Diked
2903	JP-4	25,000	Diked
2903	JP-4	25,000	Diked
2903	JP-4	25,000	Diked
2903	JP-4	25,000	Diked
2903	JP-4	25,000	Diked
2903	JP-4	25,000	Diked
2903	JP-4	25,000	Diked
2903	JP-4	25,000	Diked
2903	JP-4	11,500	Diked
2903	JP-4	11,500	Diked
2903	FS-2	25,000*	Diked
2903	FS-5	12,000	Tank car

* Split compartment tank (12,500-gallons each compartment); 12,500 gallons of FS-2 in one compartment; other compartment is nearly empty.

APPENDIX E

MASTER LIST OF INDUSTRIAL SHOPS

APPENDIX E
MASTER LIST OF INDUSTRIAL SHOPS
O'HARE ARFF

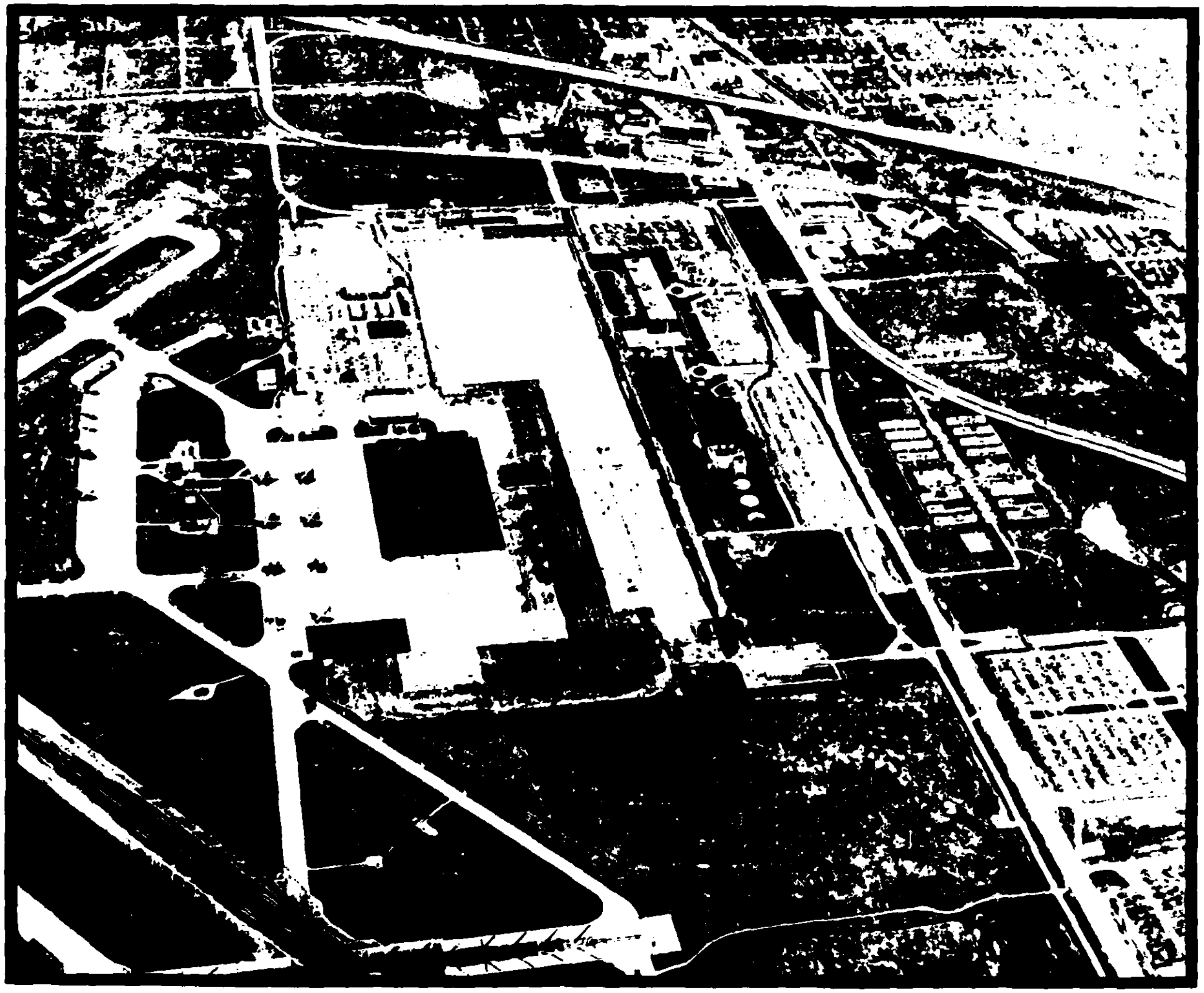
Name	Present Location (Bldg. No.)	Handles Hazardous Materials	Generates Hazardous Waste	Current TSD Method
AGE Shop	33	Yes	Yes	Contractor/Sanitary Sewer
AGE Shop*	24	Yes	Yes	Contractor/Sanitary Sewer
Vehicle Maintenance*	5	Yes	Yes	Contractor
Avionics	30	No	No	---
Avionics*	27	No	No	---
Battery/Electrical Shop	31	Yes	Yes	Contractor/Sanitary Sewer
Carpenter Shop	10	Yes	No	---
Corrosion Control	30	Yes	Yes	Contractor/General Refuse
Exterior/Interior Electric	10	No	No	---
Engine Shop	34	Yes	Yes	Contractor
Engine Shop*	70	Yes	Yes	Contractor
Fire Department	63	Yes	Yes	Contractor
Fuel Cell	35	Yes	Yes	Contractor/Internal Recycle
Fuel (POL) Storage	66	Yes	Yes	Contractor/Internal Recycle
Hangar Facility*	19	Yes	No	---
Life Support Shop	3	Yes	No	---
Machine Shop	30	Yes	Yes	Contractor

Name	Present Location (Bldg. No.)	Handles Hazardous Materials	Generates Hazardous Waste	Current TSD Method
Non-Destructive Inspection Shop	59	Yes	Yes	Sanitary Sewer
Packing and Crating	32	Yes	No	---
Painting Shop	10	Yes	No	---
Plumbing Shop	10	Yes	No	---
Pneudraulics Shop	30	Yes	Yes	Contractor
Prop. Shop	34	Yes	Yes	Contractor
Repair and Reclamation	30	Yes	Yes	Contractor
Refrigeration Shop	58	Yes	No	---
Roads and Grounds Shop	55	Yes	Yes	Contractor
Rocket Storage Facility**	411	Yes	No	---
Sheet Metal Fabrication	10	No	No	---
Stock Room/ Supply*	21,22,23	Yes	No	---
Survival Equipment Shop	61	Yes	No	---
Vehicle Maintenance Facility	50	Yes	Yes	Contractor/Sanitary Sewer
Vehicle Maintenance Facility*	12	Yes	Yes	Contractor/Sanitary Sewer
Welding Shop	30	No	No	---

* Air National Guard Facility
** Former Air National Guard Facility, no longer in use.

APPENDIX F

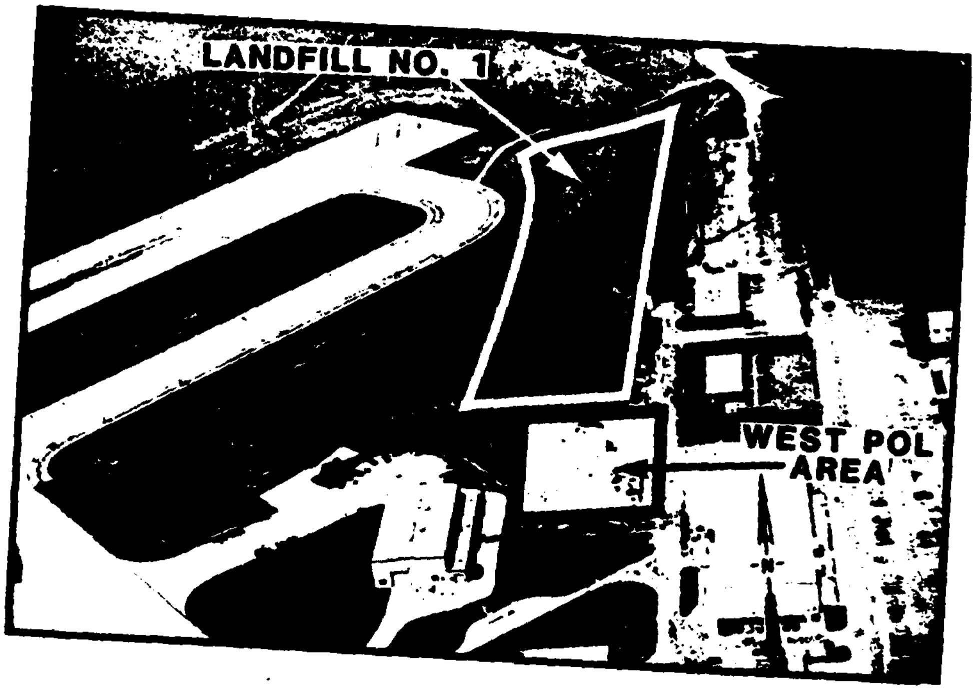
PHOTOGRAPHS

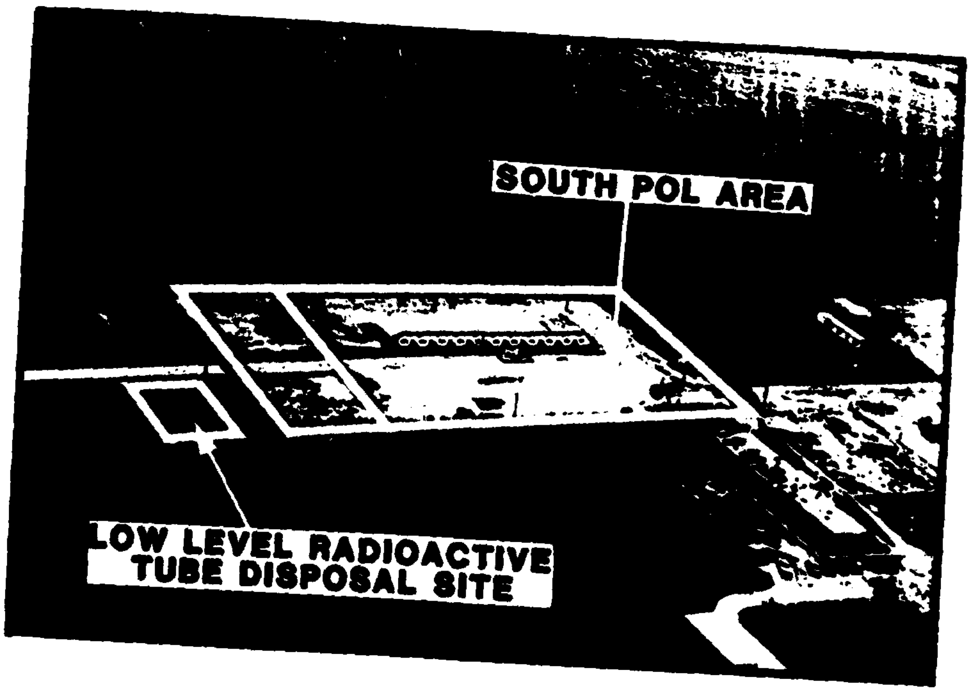


O'HARE
Air Reserve Forces Facility

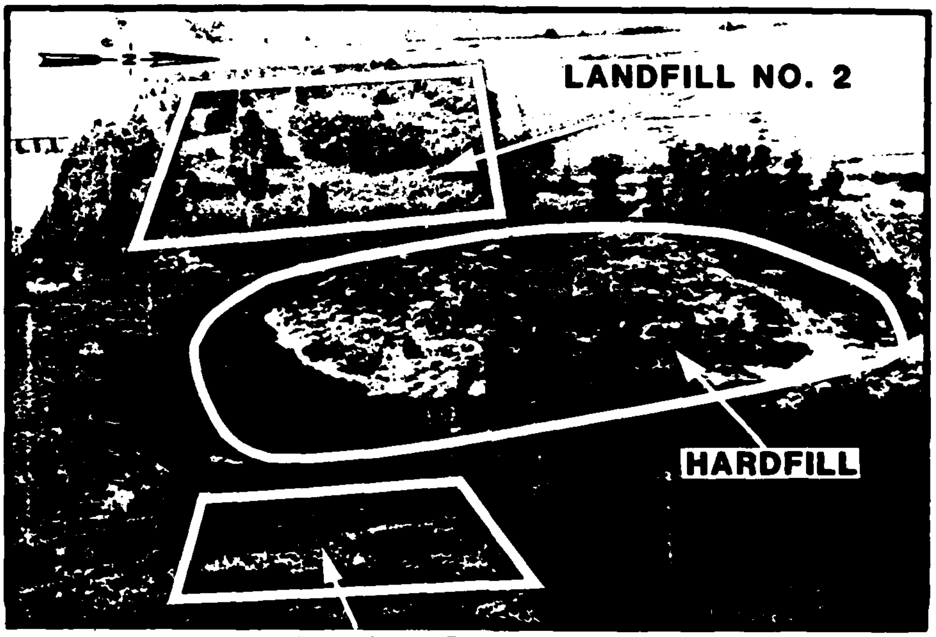
AERIAL PHOTO MID 1970's

O'HARE ARFF


LANDFILL NO. 1
WEST POL AREA

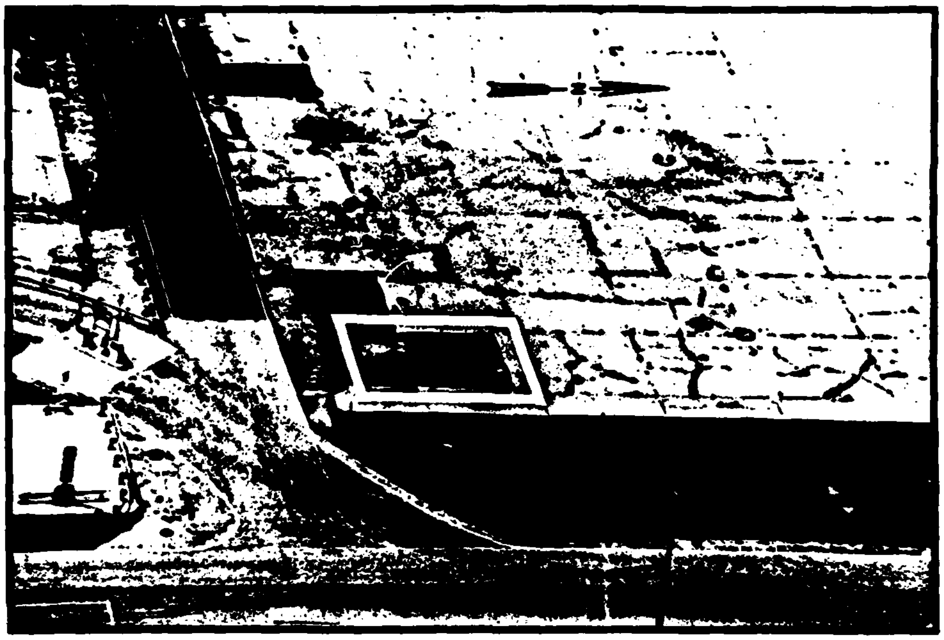

SOUTH POL AREA
LOW LEVEL RADIOACTIVE TUBE DISPOSAL SITE

O'HARE ARFF



FIRE TRAINING AREA
(APPROXIMATE LOCATION)

O'HARE ARFF



Hazardous Waste Drum Storage Area

APPENDIX G

USAF INSTALLATION RESTORATION PROGRAM

HAZARD ASSESSMENT RATING METHODOLOGY

APPENDIX G

USAF INSTALLATION RESTORATION PROGRAM
HAZARD ASSESSMENT RATING METHODOLOGY

BACKGROUND

The Department of Defense (DOD) has established a comprehensive program to identify, evaluate, and control problems associated with past disposal practices at DOD facilities. One of the actions required under this program is to:

> "develop and maintain a priority listing of contaminated installations and facilities for remedial action based on potential hazard to public health, welfare, and environmental impacts." (Reference: DEQPPM 81-5, 11 December 1981).

Accordingly, the United States Air Force (USAF) has sought to establish a system to set priorities for taking further actions at sites based upon information gathered during the Records Search phase of its Installation Restoration Program (IRP).

The first site rating model was developed in June 1981 at a meeting with represenatives from USAF Occupational and Environmental Health Laboratory (OEHL), Air Force Engineering and Services Center (AFESC), Engineering-Science (ES) and CH2M Hill. The basis for this model was a system developed for EPA by JRB Associates of McLean, Virginia. The JRB model was modified to meet Air Force needs.

After using this model for 6 months at over 20 Air Force installations, certain inadequacies became apparent. Therefore, on January 26 and 27, 1982, representatives of USAF OEHL, AFESC, various major commands, Engineering-Science, and CH2M Hill met to address the inadequacies. The result of the meeting was a new site rating model designed to present a better picture of the hazards posed by sites at Air Force installations. The new rating model described in this presentation is referred to as the Hazard Assessment Rating Methodology.

PURPOSE

The purpose of the site rating model is to provide a relative ranking of sites of suspected contamination from hazardous substances. This model will assist the Air Force in setting priorities for follow-on site investigations and confirmation work under Phase II of the IRP.

This rating system is used only after it has been determined that (1) potential for contamination exists (hazardous wastes present in sufficient quantity), and (2) potential for migration exists. A site can be deleted from consideration for rating on either basis.

DESCRIPTION OF MODEL

Like the other hazardous waste site ranking models, the U.S. Air Force's site rating model uses a scoring system to rank sites for priority attention. However, in developing this model, the designers incorporated some special features to meet specific DOD program needs.

The model uses data readily obtained during the Records Search portion (Phase I) of the IRP. Scoring judgments and computations are easily made. In assessing the hazards at a given site, the model develops a score based on the most likely routes of contamination and the worst hazards at the site. Sites are given low scores only if there are clearly no hazards at the site. This approach meshes well with the policy for evaluating and setting restrictions on excess DOD properties.

As with the previous model, this model considers four aspects of the hazard posed by a specific site: the possible receptors of the contamination, the waste and its characteristics, potential pathways for waste contaminant migration, and any efforts to contain the contaminants. Each of these categories contains a number of rating factors that are used in the overall hazard rating.

The receptors category rating is calculated by scoring each factor, multiplying by a factor weighting constant and adding the weighted scores to obtain a total category score.

The pathways category rating is based on evidence of contaminant migration or an evaluation of the highest potential (worst case) for contaminant migration along one of three pathways. If evidence of contaminant migration exists, the category is given a subscore of 80 to 100 points. For indirect evidence, 80 points are assigned and for direct evidence, 100 points are assigned. If no evidence is found, the highest score among three possible routes is used. These routes are surface water migration, flooding, and ground-water migration. Evaluation of each route involves factors associated with the particular migration route. The three pathways are evaluated and the highest score among all four of the potential scores is used.

The waste characteristics category is scored in three steps. First, a point rating is assigned based on an assessment of the waste quantity and the hazard (worst case) associated with the site. The level of confidence in the information is also factored into the assessment. Next, the score is multiplied by a waste persistence factor, which acts to reduce the score if the waste is not very persistent. Finally, the score is further modified by the physical state of the waste. Liquid wastes receive the maximum score, while scores for sludges and solids are reduced.

The scores for each of the three categories are then added together and normalized to a maximum possible score of 100. Then the waste management practice category is scored. Sites at which there is no containment are not reduced in score. Scores for sites with limited containment can be reduced by 5 percent. If a site is contained and well managed, its score can be reduced by 90 percent. The final site score is calculated by applying the waste management practices category factor to the sum of the scores for the other three categories.

FIGURE 1

HAZARD ASSESSMENT RATING METHODOLOGY FLOW CHART

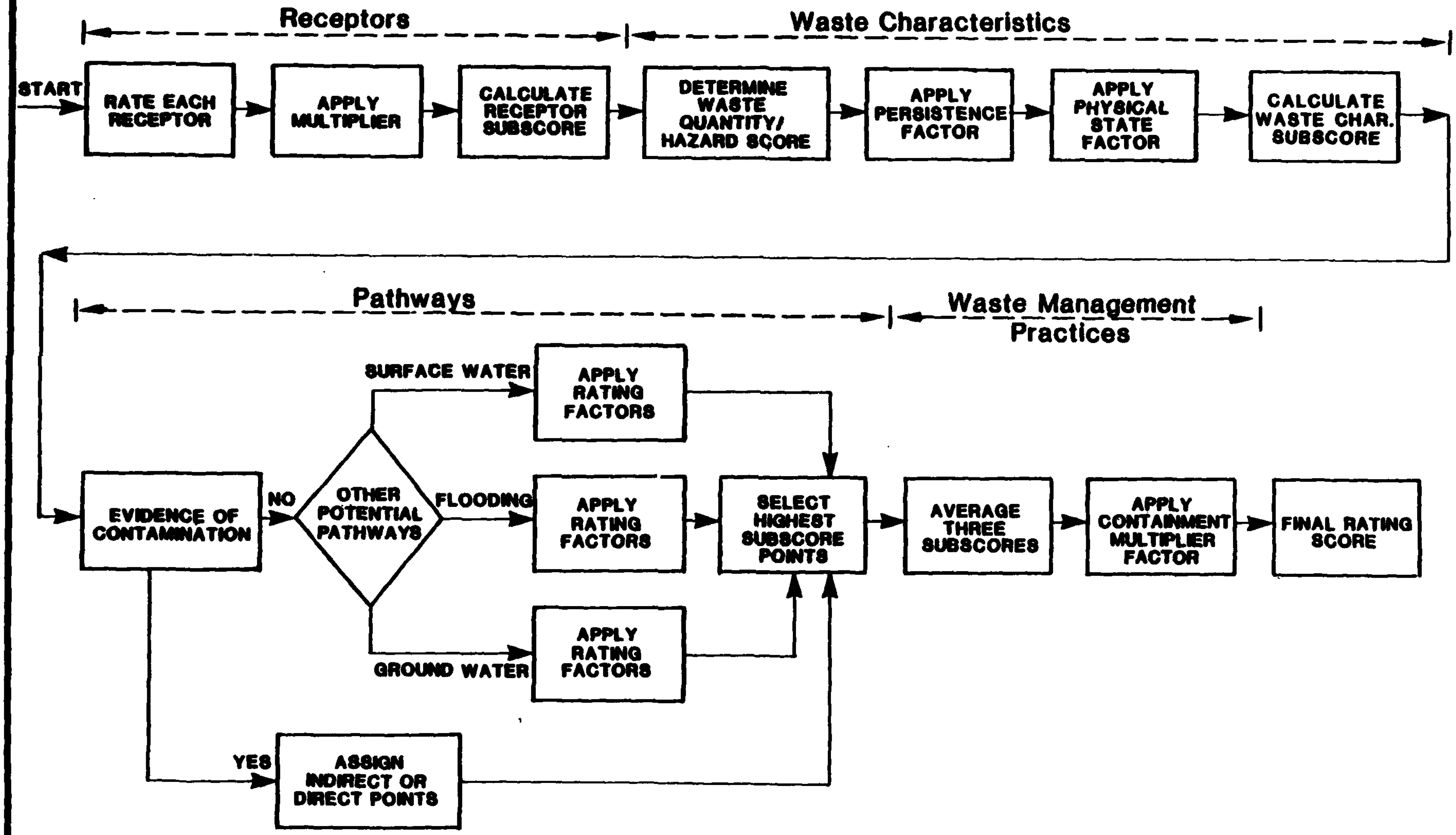


FIGURE 2

HAZARD ASSESSMENT RATING METHODOLOGY FORM

NAME OF SITE ____________________

LOCATION ____________________

DATE OF OPERATION OR OCCURRENCE ____________________

OWNER/OPERATOR ____________________

COMMENTS/DESCRIPTION ____________________

SITE RATED BY ____________________

I. RECEPTORS

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
A. Population within 1,000 feet of site		4		
B. Distance to nearest well		10		
C. Land use/zoning within 1 mile radius		3		
D. Distance to reservation boundary		6		
E. Critical environments within 1 mile radius of site		10		
F. Water quality of nearest surface water body		6		
G. Ground water use of uppermost aquifer		9		
H. Population served by surface water supply within 3 miles downstream of site		6		
I. Population served by ground-water supply within 3 miles of site		6		
		Subtotals	____	____

Receptors subscore (100 X factor score subtotal/maximum score subtotal) ____

II. WASTE CHARACTERISTICS

A. Select the factor score based on the estimated quantity, the degree of hazard, and the confidence level of the information.

1. Waste quantity (S = small, M = medium, L = large) ____
2. Confidence level (C = confirmed, S = suspected) ____
3. Hazard rating (H = high, M = medium, L = low) ____

Factor Subscore A (from 20 to 100 based on factor score matrix) ____

B. Apply persistence factor
Factor Subscore A X Persistence Factor = Subscore B

____ X ____ = ____

C. Apply physical state multiplier

Subscore B X Physical State Multiplier = Waste Characteristics Subscore

____ X ____ = ____

FIGURE 2 (Continued)

III. PATHWAYS

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score

A. If there is evidence of migration of hazardous contaminants, assign maximum factor subscore of 100 points for direct evidence or 80 points for indirect evidence. If direct evidence exists then proceed to C. If no evidence or indirect evidence exists, proceed to B.

Subscore ______

B. Rate the migration potential for 3 potential pathways: surface water migration, flooding, and ground-water migration. Select the highest rating, and proceed to C.

1. Surface water migration

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
Distance to nearest surface water		8		
Net precipitation		6		
Surface erosion		8		
Surface permeability		6		
Rainfall intensity		8		

Subtotals ______ ______

Subscore (100 X factor score subtotal/maximum score subtotal) ______

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
2. Flooding		1		

Subscore (100 x factor score/3) ______

3. Ground-water migration

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
Depth to ground water		8		
Net precipitation		6		
Soil permeability		8		
Subsurface flows		8		
Direct access to ground water		8		

Subtotals ______ ______

Subscore (100 x factor score subtotal/maximum score subtotal) ______

C. Highest pathway subscore.

Enter the highest subscore value from A, B-1, B-2 or B-3 above.

Pathways Subscore ______

IV. WASTE MANAGEMENT PRACTICES

A. Average the three subscores for receptors, waste characteristics, and pathways.

Receptors ______
Waste Characteristics ______
Pathways ______

Total ______ divided by 3 = ______
Gross Total Score

B. Apply factor for waste containment from waste management practices

Gross Total Score X Waste Management Practices Factor = Final Score

______ X ______ = [ ]

TABLE 1

HAZARD ASSESSMENT RATING METHODOLOGY GUIDELINES

I. RECEPTORS CATEGORY

Rating Factors	Rating Scale Levels: 0	1	2	3	Multiplier
A. Population within 1,000 feet (includes on-base facilities)	0	1 - 25	26 - 100	Greater than 100	4
B. Distance to nearest water well	Greater than 3 miles	1 to 3 miles	3,001 feet to 1 mile	0 to 3,000 feet	10
C. Land Use/Zoning (within 1 mile radius)	Completely remote (zoning not applicable)	Agricultural	Commercial or industrial	Residential	3
D. Distance to installation boundary	Greater than 2 miles	1 to 2 miles	1,001 feet to 1 mile	0 to 1,000 feet	6
E. Critical environments (within 1 mile radius)	Not a critical environment	Natural areas	Pristine natural areas; minor wetlands; preserved areas; presence of economically important natural resources susceptible to contamination.	Major habitat of an endangered or threatened species; presence of recharge area; major wetlands.	10
F. Water quality/use designation of nearest surface water body	Agricultural or industrial use.	Recreation, propagation and management of fish and wildlife.	Shellfish propagation and harvesting.	Potable water supplies	6
G. Ground-Water use of uppermost aquifer	Not used, other sources readily available.	Commercial, industrial, or irrigation, very limited other water sources.	Drinking water, municipal water available.	Drinking water, no municipal water available; commercial, industrial, or irrigation, no other water source available.	9
H. Population served by surface water supplies within 3 miles downstream of site	0	1 - 50	51 - 1,000	Greater than 1,000	6
I. Population served by aquifer supplies within 3 miles of site	0	1 - 50	51 - 1,000	Greater than 1, 000	6

TABLE 1 (Continued)

HAZARD ASSESSMENT RATING METHODOLOGY GUIDELINES

II. WASTE CHARACTERISTICS

A-1 Hazardous Waste Quantity

S = Small quantity (<5 tons or 20 drums of liquid)
M = Moderate quantity (5 to 20 tons or 21 to 85 drums of liquid)
L = Large quantity (>20 tons or 85 drums of liquid)

A-2 Confidence Level of Information

C = Confirmed confidence level (minimum criteria below)

- o Verbal reports from interviewer (at least 2) or written information from the records.
- o Knowledge of types and quantities of wastes generated by shops and other areas on base.
- o Based on the above, a determination of the types and quantities of waste disposed of at the site.

S = Suspected confidence level

- o No verbal reports or conflicting verbal reports and no written information from the records.
- o Logic based on a knowledge of the types and quantities of hazardous wastes generated at the base, and a history of past waste disposal practices indicate that these wastes were disposed of at a site.

A-3 Hazard Rating

Hazard Category	Rating Scale Levels 0	1	2	3
Toxicity	Sax's Level 0	Sax's Level 1	Sax's Level 2	Sax's Level 3
Ignitability	Flash point greater than 200°F	Flash point at 140°F to 200°F	Flash point at 80°F to 140°F	Flash point less than 80°F
Radioactivity	At or below background levels	1 to 3 times background levels	3 to 5 times background levels	Over 5 times background levels

Use the highest individual rating based on toxicity, ignitability and radioactivity and determine the hazard rating.

Hazard Rating	Points
High (H)	3
Medium (M)	2
Low (L)	1

TABLE 1 (Continued)

HAZARD ASSESSMENT RATING METHODOLOGY GUIDELINES

II. WASTE CHARACTERISTICS (Continued)

Waste Characteristics Matrix

Point Rating	Hazardous Waste Quantity	Confidence Level of Information	Hazard Rating
100	L	C	H
80	L	C	H
	M	C	H
70	L	S	H
60	S	C	H
	M	C	M
50	L	S	M
	L	C	L
	M	S	H
	S	C	M
40	S	S	H
	M	S	M
	M	C	L
	L	S	L
30	S	C	L
	M	S	L
	S	S	M
20	S	S	L

Notes:
For a site with more than one hazardous waste, the waste quantities may be added using the following rules:
Confidence Level
- o Confirmed confidence levels (C) can be added
- o Suspected confidence levels (S) can be added
- o Confirmed confidence levels cannot be added with suspected confidence levels

Waste Hazard Rating
- o Wastes with the same hazard rating can be added
- o Wastes with different hazard ratings can only be added *in a downgrade mode, e.g., MCM + SCH = LCM if the* total quantity is greater than 20 tons.

Example: Several wastes may be present at a site, each having an MCM designation (60 points). By adding the quantities of each waste, the designation may change to LCM (80 points). In this case, the correct point rating for the waste is 80.

B. Persistence Multiplier for Point Rating

Persistence Criteria	Multiply Point Rating From Part A by the Following
Metals, polycyclic compounds, and halogenated hydrocarbons	1.0
Substituted and other ring compounds	0.9
Straight chain hydrocarbons	0.8
Easily biodegradable compounds	0.4

C. Physical State Multiplier

Physical State	Multiply Point Total From Parts A and B by the Following
Liquid	1.0
Sludge	0.75
Solid	0.50

TABLE 1 (Continued)

HAZARD ASSESSMENT RATING METHODOLOGY GUIDELINES

III. PATHWAYS CATEGORY

A. Evidence of Contamination

Direct evidence is obtained from laboratory analyses of hazardous contaminants present above natural background levels in surface water, ground water, or air. Evidence should confirm that the source of contamination is the site being evaluated.

Indirect evidence might be from visual observation (i.e., leachate), vegetation stress, sludge deposits, presence of taste and odors in drinking water, or reported discharges that cannot be directly confirmed as resulting from the site, but the site is greatly suspected of being a source of contamination.

B-1 POTENTIAL FOR SURFACE WATER CONTAMINATION

Rating Factor	Rating Scale Levels 0	1	2	3	Multiplier
Distance to nearest surface water (includes drainage ditches and storm sewers)	Greater than 1 mile	2,001 feet to 1 mile	501 feet to 2,000 feet	0 to 500 feet	8
Net precipitation	Less than -10 in.	-10 to + 5 in.	+5 to +20 in.	Greater than +20 in.	6
Surface erosion	None	Slight	Moderate	Severe	8
Surface permeability	0% to 15% clay ($>10^{-2}$ cm/sec)	15% to 30% clay (10^{-2} to 10^{-4} cm/sec)	30% to 50% clay (10^{-4} to 10^{-6} cm/sec)	Greater than 50% clay ($<10^{-6}$ cm/sec)	6
Rainfall intensity based on 1 year 24-hr rainfall	<1.0 inch	1.0-2.0 inches	2.1-3.0 inches	>3.0 inches	8

B-2 POTENTIAL FOR FLOODING

Rating Factor	0	1	2	3	Multiplier
Floodplain	Beyond 100-year floodplain	In 25-year floodplain	In 10-year floodplain	Floods annually	1

B-3 POTENTIAL FOR GROUND-WATER CONTAMINATION

Rating Factor	0	1	2	3	Multiplier
Depth to ground water	Greater than 500 ft	50 to 500 feet	11 to 50 feet	0 to 10 feet	8
Net precipitation	Less than -10 in.	-10 to +5 in.	+5 to +20 in.	Greater than +20 in.	6
Soil permeability	Greater than 50% clay ($>10^{-6}$ cm/sec)	30% to 50% clay (10^{-4} to 10^{-6} cm/sec)	15% to 30% clay (10^{-2} to 10^{-4} cm/sec)	0% to 15% clay ($<10^{-2}$ cm/sec)	8
Subsurface flows	Bottom of site greater than 5 feet above high ground-water level	Bottom of site occasionally submerged	Bottom of site frequently submerged	Bottom of site located below mean ground-water level	8
Direct access to ground water (through faults, fractures, faulty well casings, subsidence fissures, etc.)	No evidence of risk	Low risk	Moderate risk	High risk	8

TABLE 1 (Continued)

HAZARD ASSESSMENT RATING METHODOLOGY GUIDELINES

IV. WASTE MANAGEMENT PRACTICES CATEGORY

A. This category adjusts the total risk as determined from the receptors, pathways, and waste characteristics categories for waste management practices and engineering controls designed to reduce this risk. The total risk is determined by first averaging the receptors, pathways, and waste characteristics subscores.

B. WASTE MANAGEMENT PRACTICES FACTOR

The following multipliers are then applied to the total risk points (from A):

Waste Management Practice	Multiplier
No containment	1.0
Limited containment	0.95
Fully contained and in full compliance	0.10

Guidelines for fully contained:

Landfills:

- o Clay cap or other impermeable cover
- o Leachate collection system
- o Liners in good condition
- o Adequate monitoring wells

Spills:

- o Quick spill cleanup action taken
- o Contaminated soil removed
- o Soil and/or water samples confirm total cleanup of the spill

Surface Impoundments:

- o Liners in good condition
- o Sound dikes and adequate freeboard
- o Adequate monitoring wells

Fire Proection Training Areas:

- o Concrete surface and berms
- o Oil/water separator for pretreatment of runoff
- o Effluent from oil/water separator to treatment plant

General Note: If data are not available or known to be complete the *factor ratings* under items I-A through I, III-B-1 or III-B-3, then leave blank for calculation of factor score and maximum possible score.

APPENDIX H

HAZARD ASSESSMENT RATING FORMS

TABLE OF CONTENTS

HAZARD ASSESSMENT RATING FORMS
O'HARE ARFF

HAZARD ASSESSMENT RATING METHODOLOGY FORM

Name of Site: LANDFILL NO. 1
Location: NORTHWEST AREA OF BASE
Date of Operation or Occurrence: 1953 TO 1960'S
Owner/Operator: OHARE ARFF
Comments/Description: TRENCH AND FILL TYPE

Site Rated by: GREGORY.McLEOD & REIMER

I. RECEPTORS

Rating Factor	Factor Rating (0-3)	Multi-plier	Factor Score	Maximum Possible Score
A. Population within 1,000 feet of site	3	4	12	12
B. Distance to nearest well	1	10	10	30
C. Land use/zoning within 1 mile radius	3	3	9	9
D. Distance to reservation boundry	3	6	18	18
E. Critical environments within 1 mile radius of site	3	10	30	30
F. Water quality of nearest surface water body	1	6	6	18
G. Ground water use of uppermost aquifer	0	9	0	27
H. Population served by surface water supply within 3 miles downstream of site	0	6	0	18
I. Population served by ground-water supply within 3 miles of site	3	6	18	18
Subtotals			103	180

Receptors subscore (100 x factor score subtotal/maximum score subtotal) 57

II. WASTE CHARACTERISTICS

A. Select the factor score based on the estimated quantity, the degree of hazard, and the confidence level of the information.

1. Waste quantity (1=small, 2=medium, 3=large) 3
2. Confidence level (1=confirmed, 2=suspected) 1
3. Hazard rating (1=low, 2=medium, 3=high) 3

Factor Subscore A (from 20 to 100 based on factor score matrix) 100

B. Apply persistence factor
Factor Subscore A x Persistence Factor = Subscore B

100 x 0.90 = 90

C. Apply physical state multiplier
Subscore B x Physical State Multiplier = Waste Characteristics Subscore

90 x 1.00 = 90

III. PATHWAYS

A. If there is evidence of migration of hazardous contaminants, assign maximum factor subscore of 100 points for direct evidence or 80 points for indirect evidence. If direct evidence exists then proceed to C. If no evidence or indirect evidence exists, proceed to B.

Subscore 0

B. Rate the migration potential for 3 potential pathways: surface water migration, flooding, and ground-water migration. Select the highest rating and proceed to C.

Rating Factor	Factor Rating (0-3)	Multi-plier	Factor Score	Maximum Possible Score
1. Surface Water Migration				
Distance to nearest surface water	3	8	24	24
Net precipitation	1	6	6	18
Surface erosion	1	8	8	24
Surface permeability	3	6	18	18
Rainfall intensity	2	8	16	24
Subtotals			72	108
Subscore (100 x factor score subtotal/maximum score subtotal)				67
2. Flooding	1	1	1	3
Subscore (100 x factor score/3)				33
3. Ground-water migration				
Depth to ground water	3	8	24	24
Net precipitation	1	6	6	18
Soil permeability	0	8	0	24
Subsurface flows	1	8	8	24
Direct access to ground water	1	8	8	24
Subtotals			46	114
Subscore (100 x factor score subtotal/maximum score subtotal)				40

C. Highest pathway subscore.

Enter the highest subscore value from A, B-1, B-2 or B-3 above.

Pathways Subscore 67

IV. WASTE MANAGEMENT PRACTICES

A. Average the three subscores for receptors, waste characteristics, and pathways.

Receptors		57
Waste Characteristics		90
Pathways		67
Total	214 divided by 3 =	71 Gross total score

B. Apply factor for waste containment from waste management practices.

Gross total score x waste management practices factor = final score

71 x 0.95 = 68

HAZARD ASSESSMENT RATING METHODOLOGY FORM

Name of Site: JP-4 TANK DIKE
Location: WEST POL AREA
Date of Operation or Occurrence: JANUARY 1972
Owner/Operator: OHARE ARFF
Comments/Description: SPILL IN DIKE; 42,000 GALLONS NOT RECOVERED

Site Rated by: GREGORY, McLEOD & REIMER

I. RECEPTORS

Rating Factor	Factor Rating (0-3)	Multi-plier	Factor Score	Maximum Possible Score
A. Population within 1,000 feet of site	3	4	12	12
B. Distance to nearest well	1	10	10	30
C. Land use/zoning within 1 mile radius	3	3	9	9
D. Distance to reservation boundry	3	6	18	18
E. Critical environments within 1 mile radius of site	3	10	30	30
F. Water quality of nearest surface water body	1	6	6	18
G. Ground water use of uppermost aquifer	0	9	0	27
H. Population served by surface water supply within 3 miles downstream of site	0	6	0	18
I. Population served by ground-water supply within 3 miles of site	3	6	18	18
Subtotals			103	180

Receptors subscore (100 x factor score subtotal/maximum score subtotal) 57

II. WASTE CHARACTERISTICS

A. Select the factor score based on the estimated quantity, the degree of hazard, and the confidence level of the information.

1. Waste quantity (1=small, 2=medium, 3=large) 3
2. Confidence level (1=confirmed, 2=suspected) 1
3. Hazard rating (1=low, 2=medium, 3=high) 3

Factor Subscore A (from 20 to 100 based on factor score matrix) 100

B. Apply persistence factor
Factor Subscore A x Persistence Factor = Subscore B

100 x 0.80 = 80

C. Apply physical state multiplier
Subscore B x Physical State Multiplier = Waste Characteristics Subscore

80 x 1.00 = 80

III. PATHWAYS

A. If there is evidence of migration of hazardous contaminants, assign maximum factor subscore of 100 points for direct evidence or 80 points for indirect evidence. If direct evidence exists then proceed to C. If no evidence or indirect evidence exists, proceed to B.

Subscore 0

B. Rate the migration potential for 3 potential pathways: surface water migration, flooding, and ground-water migration. Select the highest rating and proceed to C.

Rating Factor	Factor Rating (0-3)	Multi-plier	Factor Score	Maximum Possible Score
1. Surface Water Migration				
Distance to nearest surface water	3	8	24	24
Net precipitation	1	6	6	18
Surface erosion	1	8	8	24
Surface permeability	3	6	18	18
Rainfall intensity	2	8	16	24
Subtotals			72	108
Subscore (100 x factor score subtotal/maximum score subtotal)				67
2. Flooding	0	1	0	3
Subscore (100 x factor score/3)				0
3. Ground-water migration				
Depth to ground water	3	8	24	24
Net precipitation	1	6	6	18
Soil permeability	0	8	0	24
Subsurface flows	0	8	0	24
Direct access to ground water	1	8	8	24
Subtotals			38	114
Subscore (100 x factor score subtotal/maximum score subtotal)				33

C. Highest pathway subscore.

Enter the highest subscore value from A, B-1, B-2 or B-3 above.

Pathways Subscore 67

IV. WASTE MANAGEMENT PRACTICES

A. Average the three subscores for receptors, waste characteristics, and pathways.

Receptors		57
Waste Characteristics		80
Pathways		67
Total	204 divided by 3 =	68 Gross total score

B. Apply factor for waste containment from waste management practices.

Gross total score x waste management practices factor = final score

68 x 0.95 = 65

HAZARD ASSESSMENT RATING METHODOLOGY FORM

Name of Site: FUEL-CONTAMINATED SOIL
Location: BENEATH MAIN PARKING APRON
Date of Operation or Occurrence: 1976
Owner/Operator: GHARE HARP
Comments/Description: SOIL 3 TO 4 FEET BELOW THE SURFACE WAS FOUND TO CONTAIN JP-4

Site Rated by: **GREGORY, McLEOD & REIMER**

I. RECEPTORS

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
A. Population within 1,000 feet of site	3	4	12	[illegible]
B. Distance to nearest well	1	10	10	30
C. Land use/zoning within 1 mile radius	2	3	[illegible]	9
D. Distance to reservation boundary	3	6	18	18
E. Critical environments within 1 mile radius of site	3	10	30	30
F. Water quality of nearest surface water body	1	6	[illegible]	18
G. Ground water use of uppermost aquifer	0	9	0	27
H. Population served by surface water supply within 3 miles downstream of site	0	6	[illegible]	18
I. Population served by ground-water supply within 3 miles of site	3	6	18	18
Subtotals			102	180

Receptors subscore (100 x factor score subtotal/maximum score subtotal) 57

II. WASTE CHARACTERISTICS

A. Select the factor score based on the estimated quantity, the degree of hazard, and the confidence level of the information.

1. Waste quantity (1=small, 2=medium, 3=large) 1
2. Confidence level (1=confirmed, 2=suspected) 1
3. Hazard rating (1=low, 2=medium, 3=high) 1

Factor Subscore A (from 20 to 100 based on factor score matrix) 60

B. Apply persistence factor
Factor Subscore A x Persistence Factor = Subscore B

60 x 0.90 = 54

C. Apply physical state multiplier
Subscore B x Physical State Multiplier = Waste Characteristics Subscore

54 x 1.00 = 54

III. PATHWAYS

A. If there is evidence of migration of hazardous contaminants, assign maximum factor subscore of 100 points for direct evidence or 80 points for indirect evidence. If direct evidence exists then proceed to C. If no evidence or indirect evidence exists, proceed to B.

Subscore 80

B. Rate the migration potential for 3 potential pathways: surface water migration, flooding, and ground-water migration. Select the highest rating and proceed to C.

Rating Factor	Factor Rating (0-3)	Multi-plier	Factor Score	Maximum Possible Score
1. Surface Water Migration				
Distance to nearest surface water	3	8	24	24
Net precipitation	1	6	6	18
Surface erosion	1	8	8	24
Surface permeability	3	6	18	18
Rainfall intensity	2	8	16	24
Subtotals			72	108

Subscore (100 x factor score subtotal/maximum score subtotal) 67

2. Flooding	1	1	1	3

Subscore (100 x factor score/3) 33

3. Ground-water migration				
Depth to ground water	3	8	24	24
Net precipitation	1	6	6	18
Soil permeability	0	8	0	24
Subsurface flows	1	8	8	24
Direct access to ground water	2	8	16	24
Subtotals			54	114

Subscore (100 x factor score subtotal/maximum score subtotal) 47

C. Highest pathway subscore.

Enter the highest subscore value from A, B-1, B-2 or B-3 above.

Pathways Subscore 80

IV. WASTE MANAGEMENT PRACTICES

A. Average the three subscores for receptors, waste characteristics, and pathways.

Receptors		57	
Waste Characteristics		54	
Pathways		80	
Total	191 divided by 3 =		64 Gross total score

B. Apply factor for waste containment from waste management practices.

Gross total score x waste management practices factor = final score

64 x 1.00 = 64

HAZARD ASSESSMENT RATING METHODOLOGY FORM

Name of Site: DEFUELING PIT LEAK SITE
Location: WEST PERIMETER OF BASE
Date of Operation or Occurrence: LATE 1960'S
Owner/Operator: OHARE ARFF
Comments/Description:

Site Rated by: GREGORY, McLEOD & REIMER

I. RECEPTORS

Rating Factor	Factor Rating (0-3)	Multi-plier	Factor Score	Maximum Possible Score
A. Population within 1,000 feet of site	3	4	12	12
B. Distance to nearest well	1	10	10	30
C. Land use/zoning within 1 mile radius	3	3	9	9
D. Distance to reservation boundry	3	6	18	18
E. Critical environments within 1 mile radius of site	3	10	30	30
F. Water quality of nearest surface water body	1	6	6	18
G. Ground water use of uppermost aquifer	0	9	0	27
H. Population served by surface water supply within 3 miles downstream of site	0	6	0	18
I. Population served by ground-water supply within 3 miles of site	3	6	18	18
Subtotals			103	180

Receptors subscore (100 x factor score subtotal/maximum score subtotal) 57

II. WASTE CHARACTERISTICS

A. Select the factor score based on the estimated quantity, the degree of hazard, and the confidence level of the information.

1. Waste quantity (1=small, 2=medium, 3=large) 2
2. Confidence level (1=confirmed, 2=suspected) 1
3. Hazard rating (1=low, 2=medium, 3=high) 3

Factor Subscore A (from 20 to 100 based on factor score matrix) 80

B. Apply persistence factor
Factor Subscore A x Persistence Factor = Subscore B

80 x 0.80 = 64

C. Apply physical state multiplier
Subscore B x Physical State Multiplier = Waste Characteristics Subscore

64 x 1.00 = 64

III. PATHWAYS

A. If there is evidence of migration of hazardous contaminants, assign maximum factor subscore of 100 points for direct evidence or 80 points for indirect evidence. If direct evidence exists then proceed to C. If no evidence or indirect evidence exists, proceed to B.

Subscore 0

B. Rate the migration potential for 3 potential pathways: surface water migration, flooding, and ground-water migration. Select the highest rating and proceed to C.

Rating Factor	Factor Rating (0-3)	Multi-plier	Factor Score	Maximum Possible Score
1. Surface Water Migration				
Distance to nearest surface water	3	8	24	24
Net precipitation	1	6	6	18
Surface erosion	1	8	8	24
Surface permeability	3	6	18	18
Rainfall intensity	2	8	16	24
Subtotals			72	108
Subscore (100 x factor score subtotal/maximum score subtotal)				67
2. Flooding	0	1	0	3
Subscore (100 x factor score/3)				0
3. Ground-water migration				
Depth to ground water	3	8	24	24
Net precipitation	1	6	6	18
Soil permeability	0	8	0	24
Subsurface flows	0	8	0	24
Direct access to ground water	1	8	8	24
Subtotals			38	114
Subscore (100 x factor score subtotal/maximum score subtotal)				33

C. Highest pathway subscore.

Enter the highest subscore value from A, B-1, B-2 or B-3 above.

Pathways Subscore 67

IV. WASTE MANAGEMENT PRACTICES

A. Average the three subscores for receptors, waste characteristics, and pathways.

Receptors		57
Waste Characteristics		64
Pathways		67
Total	188 divided by 3 =	63 Gross total score

B. Apply factor for waste containment from waste management practices.

Gross total score x waste management practices factor = final score

63 x 1.00 = 63

HAZARD ASSESSMENT RATING METHODOLOGY FORM

Name of Site: FIRE PROTECTION TRAINING AREA
Location: SOUTHEAST OF HARPER DR. AND OLD MANNHEIM RD.
Date of Operation or Occurrence: 1955 TO EARLY 1960'S
Owner/Operator: OHARE ARFF
Comments/Description:

Site Rated by: GREGORY, McLEOD & REIMER

I. RECEPTORS

Rating Factor	Factor Rating (0-3)	Multi-plier	Factor Score	Maximum Possible Score
A. Population within 1,000 feet of site	3	4	12	12
B. Distance to nearest well	1	10	10	30
C. Land use/zoning within 1 mile radius	3	3	9	9
D. Distance to reservation boundry	3	6	18	18
E. Critical environments within 1 mile radius of site	3	10	30	30
F. Water quality of nearest surface water body	1	6	6	18
G. Ground water use of uppermost aquifer	0	9	0	27
H. Population served by surface water supply within 3 miles downstream of site	0	6	0	18
I. Population served by ground-water supply within 3 miles of site	3	6	18	18
Subtotals			103	180

Receptors subscore (100 x factor score subtotal/maximum score subtotal) 57

II. WASTE CHARACTERISTICS

A. Select the factor score based on the estimated quantity, the degree of hazard, and the confidence level of the information.

1. Waste quantity (1=small, 2=medium, 3=large) 2
2. Confidence level (1=confirmed, 2=suspected) 1
3. Hazard rating (1=low, 2=medium, 3=high) 3

Factor Subscore A (from 20 to 100 based on factor score matrix) 80

B. Apply persistence factor
Factor Subscore A x Persistence Factor = Subscore B

80 x 0.80 = 64

C. Apply physical state multiplier
Subscore B x Physical State Multiplier = Waste Characteristics Subscore

64 x 1.00 = 64

III. PATHWAYS

A. If there is evidence of migration of hazardous contaminants, assign maximum factor subscore of 100 points for direct evidence of 80 points for indirect evidence. If direct evidence exists then proceed to C. If no evidence or indirect evidence exists, proceed to B.

Subscore 0

B. Rate the migration potential for 3 potential pathways: surface water migration, flooding, and ground-water migration. Select the highest rating and proceed to C.

Rating Factor	Factor Rating (0-3)	Multi-plier	Factor Score	Maximum Possible Score
1. Surface Water Migration				
Distance to nearest surface water	3	8	24	24
Net precipitation	1	6	6	18
Surface erosion	1	8	8	24
Surface permeability	3	6	18	18
Rainfall intensity	2	8	16	24
Subtotals			72	108
Subscore (100 x factor score subtotal/maximum score subtotal)				67
2. Flooding	0	1	0	3
Subscore (100 x factor score/3)				0
3. Ground-water migration				
Depth to ground water	3	8	24	24
Net precipitation	1	6	6	18
Soil permeability	0	8	0	24
Subsurface flows	0	8	0	24
Direct access to ground water	1	8	8	24
Subtotals			38	114
Subscore (100 x factor score subtotal/maximum score subtotal)				33

C. Highest pathway subscore.

Enter the highest subscore value from A, B-1, B-2 or B-3 above.

Pathways Subscore 67

IV. WASTE MANAGEMENT PRACTICES

A. Average the three subscores for receptors, waste characteristics, and pathways.

Receptors		57
Waste Characteristics		64
Pathways		67
Total	188 divided by 3 =	63 Gross total score

B. Apply factor for waste containment from waste management practices.

Gross total score x waste management practices factor = final score

63 x 0.95 = \ 60 \

HAZARD ASSESSMENT RATING METHODOLOGY FORM

Name of Site: HAZARDOUS WASTE STORAGE AREA
Location: SOUTHERNMOST EDGE OF OLD ASSEMBLY PLANT FOUNDATION
Date of Operation or Occurrence: PRESENT
Owner/Operator: OHARE ARFF
Comments/Description: DRUMS IN DEPRESSED EARTH AREA

Site Rated by: GREGORY, McLEOD & REIMER

I. RECEPTORS

Rating Factor	Factor Rating (0-3)	Multi-plier	Factor Score	Maximum Possible Score
A. Population within 1,000 feet of site	3	4	12	12
B. Distance to nearest well	1	10	10	30
C. Land use/zoning within 1 mile radius	3	3	9	9
D. Distance to reservation boundry	3	6	18	18
E. Critical environments within 1 mile radius of site	3	10	30	30
F. Water quality of nearest surface water body	1	6	6	18
G. Ground water use of uppermost aquifer	0	9	0	27
H. Population served by surface water supply within 3 miles downstream of site	0	6	0	18
I. Population served by ground-water supply within 3 miles of site	3	6	18	18
Subtotals			103	180

Receptors subscore (100 x factor score subtotal/maximum score subtotal) 57

II. WASTE CHARACTERISTICS

A. Select the factor score based on the estimated quantity, the degree of hazard, and the confidence level of the information.

1. Waste quantity (1=small, 2=medium, 3=large) 1
2. Confidence level (1=confirmed, 2=suspected) 1
3. Hazard rating (1=low, 2=medium, 3=high) 3

Factor Subscore A (from 20 to 100 based on factor score matrix) 60

B. Apply persistence factor
Factor Subscore A x Persistence Factor = Subscore B

60 x 1.00 = 60

C. Apply physical state multiplier
Subscore B x Physical State Multiplier = Waste Characteristics Subscore

60 x 1.00 = 60

III. PATHWAYS

A. If there is evidence of migration of hazardous contaminants, assign maximum factor subscore of 100 points for direct evidence or 80 points for indirect evidence. If direct evidence exists then proceed to C. If no evidence or indirect evidence exists, proceed to B.

Subscore 0

B. Rate the migration potential for 3 potential pathways: surface water migration, flooding, and ground-water migration. Select the highest rating and proceed to C.

Rating Factor	Factor Rating (0-3)	Multi-plier	Factor Score	Maximum Possible Score
1. Surface Water Migration				
Distance to nearest surface water	3	8	24	24
Net precipitation	1	6	6	18
Surface erosion	1	8	8	24
Surface permeability	3	6	18	18
Rainfall intensity	2	8	16	24
Subtotals			72	108
Subscore (100 x factor score subtotal/maximum score subtotal)				67
2. Flooding	0	1	0	3
Subscore (100 x factor score/3)				0
3. Ground-water migration				
Depth to ground water	3	8	24	24
Net precipitation	1	6	6	18
Soil permeability	0	8	0	24
Subsurface flows	0	8	0	24
Direct access to ground water	1	8	8	24
Subtotals			38	114
Subscore (100 x factor score subtotal/maximum score subtotal)				33

C. Highest pathway subscore.

Enter the highest subscore value from A, B-1, B-2 or B-3 above.

Pathways Subscore 67

IV. WASTE MANAGEMENT PRACTICES

A. Average the three subscores for receptors, waste characteristics, and pathways.

Receptors		57
Waste Characteristics		60
Pathways		67
Total	184 divided by 3 =	61 Gross total score

B. Apply factor for waste containment from waste management practices.

Gross total score x waste management practices factor = final score

61 x 0.95 = 58

HAZARD ASSESSMENT RATING METHODOLOGY FORM

Name of Site: LANDFILL NO. 2
Location: SOUTHEAST AREA OF BASE
Date of Operation or Occurrence: 1965 TO EARLY 1970'S
Owner/Operator: OHARE ARFF
Comments/Description: TRENCH AND FILL TYPE

Site Rated by: GREGORY, McLEOD & REIMER

I. RECEPTORS

Rating Factor	Factor Rating (0-3)	Multi-plier	Factor Score	Maximum Possible Score
A. Population within 1,000 feet of site	3	4	12	12
B. Distance to nearest well	1	10	10	30
C. Land use/zoning within 1 mile radius	3	3	9	9
D. Distance to reservation boundry	3	6	18	18
E. Critical environments within 1 mile radius of site	3	10	30	30
F. Water quality of nearest surface water body	1	6	6	18
G. Ground water use of uppermost aquifer	0	9	0	27
H. Population served by surface water supply within 3 miles downstream of site	0	6	0	18
I. Population served by ground-water supply within 3 miles of site	3	6	18	18
Subtotals			103	180

Receptors subscore (100 x factor score subtotal/maximum score subtotal) 57

II. WASTE CHARACTERISTICS

A. Select the factor score based on the estimated quantity, the degree of hazard, and the confidence level of the information.

1. Waste quantity (1=small, 2=medium, 3=large) 2
2. Confidence level (1=confirmed, 2=suspected) 2
3. Hazard rating (1=low, 2=medium, 3=high) 3

Factor Subscore A (from 20 to 100 based on factor score matrix) 50

B. Apply persistence factor
Factor Subscore A x Persistence Factor = Subscore B

50 x 1.00 = 50

C. Apply physical state multiplier
Subscore B x Physical State Multiplier = Waste Characteristics Subscore

50 x 1.00 = 50

III. PATHWAYS

A. If there is evidence of migration of hazardous contaminants, assign maximum factor subscore of 100 points for direct evidence or 80 points for indirect evidence. If direct evidence exists then proceed to C. If no evidence or indirect evidence exists, proceed to B.

Subscore 0

B. Rate the migration potential for 3 potential pathways: surface water migration, flooding, and ground-water migration. Select the highest rating and proceed to C.

Rating Factor	Factor Rating (0-3)	Multi-plier	Factor Score	Maximum Possible Score
1. Surface Water Migration				
Distance to nearest surface water	3	8	24	24
Net precipitation	1	6	6	18
Surface erosion	1	8	8	24
Surface permeability	3	6	18	18
Rainfall intensity	2	8	16	24
Subtotals			72	108
Subscore (100 x factor score subtotal/maximum score subtotal)				67
2. Flooding	0	1	0	3
Subscore (100 x factor score/3)				0
3. Ground-water migration				
Depth to ground water	3	8	24	24
Net precipitation	1	6	6	18
Soil permeability	0	8	0	24
Subsurface flows	1	8	8	24
Direct access to ground water	1	8	8	24
Subtotals			46	114
Subscore (100 x factor score subtotal/maximum score subtotal)				40

C. Highest pathway subscore.

Enter the highest subscore value from A, B-1, B-2 or B-3 above.

Pathways Subscore 67

IV. WASTE MANAGEMENT PRACTICES

A. Average the three subscores for receptors, waste characteristics, and pathways.

Receptors		57		
Waste Characteristics		50		
Pathways		67		
Total	174	divided by 3 =	58	Gross total score

B. Apply factor for waste containment from waste management practices.

Gross total score x waste management practices factor = final score

58 x 0.95 = \ 55 \

HAZARD ASSESSMENT RATING METHODOLOGY FORM

Name of Site: STORM DRAINAGE SYSTEM - AIRCRAFT HANGAR AREA
Location: [illegible] 19 AND 30
Date of Operation or Occurrence: 1942-PRESENT
Owner/Operator: [illegible]
Comments/Description: SYSTEM CONSISTS OF BOTH WOOD AND CONCRETE PIPE

Site Rated by: GREGORY, McLEOD & REIMER

I. RECEPTORS

Rating Factor	Factor Rating (0-3)	Multi-plier	Factor Score	Maximum Possible Score
A. Population within 1,000 feet of site	3	4	12	[illegible]
B. Distance to nearest well	1	10	10	30
C. Land use/zoning within 1 mile radius	3	3	9	[illegible]
D. Distance to reservation boundary	[illegible]	[illegible]	[illegible]	[illegible]
E. Critical environments within 1 mile radius of site	3	10	30	[illegible]
F. Water quality of nearest surface water body		6	[illegible]	[illegible]
G. Ground water use of uppermost aquifer	[illegible]	9	[illegible]	[illegible]
H. Population served by surface water supply within 3 miles downstream of site	0	6	0	18
I. Population served by ground-water supply within 3 miles of site	3	6	18	[illegible]
Subtotals			103	180

Receptors subscore (100 x factor score subtotal/maximum score subtotal) 57

II. WASTE CHARACTERISTICS

A. Select the factor score based on the estimated quantity, the degree of hazard, and the confidence level of the information.

1. Waste quantity (1=small, 2=medium, 3=large) 1
2. Confidence level (1=confirmed, 2=suspected) 2
3. Hazard rating (1=low, 2=medium, 3=high) 1

Factor Subscore A (from 20 to 100 based on factor score matrix) 40

B. Apply persistence factor
Factor Subscore A x Persistence Factor = Subscore B

40 x 0.90 = 36

C. Apply physical state multiplier
Subscore B x Physical State Multiplier = Waste Characteristics Subscore

36 x 1.00 = 36

III. PATHWAYS

A. [illegible] evidence. If direct evidence exists then proceed to C. If no evidence [illegible] proceed to B.

Subscore [illegible]

B. Rate the migration potential for 3 potential pathways: surface water migration, flooding, and ground-water migration. Select the highest rating, and proceed to C.

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
1. Surface Water Migration				
Distance to nearest surface water	3	8	24	24
Net precipitation	1	6	6	18
Surface erosion	[illegible]	8	[illegible]	24
Surface permeability	3	[illegible]	[illegible]	18
Rainfall intensity	2	8	16	24
Subtotals			72	108
Subscore (100 x factor score subtotal/maximum score subtotal)				67
2. Flooding	2	1	2	3
Subscore (100 x factor score/3)				67
3. Ground-water migration				
Depth to ground water	3	8	24	24
Net precipitation	1	6	6	18
Soil permeability	0	8	0	24
Subsurface flows	2	8	16	24
Direct access to ground water	3	8	24	24
Subtotals			70	114
Subscore (100 x factor score subtotal/maximum score subtotal)				61

C. Highest pathway subscore.

Enter the highest subscore value from A, B-1, B-2 or B-3 above.

Pathways Subscore 67

IV. WASTE MANAGEMENT PRACTICES

A. Average the three subscores for receptors, waste characteristics, and pathways.

Receptors	57
Waste Characteristics	36
Pathways	67
Total 160 divided by 3 =	53 Gross total score

B. Apply factor for waste containment from waste management practices.

Gross total score x waste management practices factor = final score

53 x 1.00 = 53

HAZARD ASSESSMENT RATING METHODOLOGY FORM

Name of Site: SOUTH EDGE OF APRON
Location: SOUTHERN PERIMETER OF BASE
Date of Operation or Occurrence: PRIOR TO 1970
Owner/Operator: OHARE ARFF
Comments/Description: DISPOSAL OF SMALL QUANTITIES OF SHOPWASTES ONTO EARTH

Site Rated by: GREGORY, McLEOD & REIMER

I. RECEPTORS

Rating Factor	Factor Rating (0-3)	Multi-plier	Factor Score	Maximum Possible Score
A. Population within 1,000 feet of site	3	4	12	12
B. Distance to nearest well	1	10	10	30
C. Land use/zoning within 1 mile radius	3	3	9	9
D. Distance to reservation boundry	3	6	18	18
E. Critical environments within 1 mile radius of site	3	10	30	30
F. Water quality of nearest surface water body	1	6	6	18
G. Ground water use of uppermost aquifer	0	9	0	27
H. Population served by surface water supply within 3 miles downstream of site	0	6	0	18
I. Population served by ground-water supply within 3 miles of site	3	6	18	18
Subtotals			103	180

Receptors subscore (100 x factor score subtotal/maximum score subtotal) 57

II. WASTE CHARACTERISTICS

A. Select the factor score based on the estimated quantity, the degree of hazard, and the confidence level of the information.

1. Waste quantity (1=small, 2=medium, 3=large) 1
2. Confidence level (1=confirmed, 2=suspected) 2
3. Hazard rating (1=low, 2=medium, 3=high) 3

Factor Subscore A (from 20 to 100 based on factor score matrix) 40

B. Apply persistence factor
Factor Subscore A x Persistence Factor = Subscore B

40 x 0.80 = 32

C. Apply physical state multiplier
Subscore B x Physical State Multiplier = Waste Characteristics Subscore

32 x 1.00 = 32

III. PATHWAYS

A. If there is evidence of migration of hazardous contaminants, assign maximum factor subscore of 100 points for direct evidence or 80 points for indirect evidence. If direct evidence exists then proceed to C. If no evidence or indirect evidence exists, proceed to B.

Subscore 0

B. Rate the migration potential for 3 potential pathways: surface water migration, flooding, and ground-water migration. Select the highest rating and proceed to C.

Rating Factor	Factor Rating (0-3)	Multi-plier	Factor Score	Maximum Possible Score
1. Surface Water Migration				
Distance to nearest surface water	3	8	24	24
Net precipitation	1	6	6	18
Surface erosion	1	8	8	24
Surface permeability	3	6	18	18
Rainfall intensity	2	8	16	24
Subtotals			72	108
Subscore (100 x factor score subtotal/maximum score subtotal)				67
2. Flooding	0	1	0	3
Subscore (100 x factor score/3)				0
3. Ground-water migration				
Depth to ground water	3	8	24	24
Net precipitation	1	6	6	18
Soil permeability	0	8	0	24
Subsurface flows	0	8	0	24
Direct access to ground water	1	8	8	24
Subtotals			38	114
Subscore (100 x factor score subtotal/maximum score subtotal)				33

C. Highest pathway subscore.
Enter the highest subscore value from A, B-1, B-2 or B-3 above.

Pathways Subscore 67

IV. WASTE MANAGEMENT PRACTICES

A. Average the three subscores for receptors, waste characteristics, and pathways.

Receptors		57
Waste Characteristics		32
Pathways		67
Total	156 divided by 3 =	52 Gross total score

B. Apply factor for waste containment from waste management practices.
Gross total score x waste management practices factor = final score

52 x 1.00 = 52

HAZARD ASSESSMENT RATING METHODOLOGY FORM

Name of Site: VEHICLE MAINTENANCE FACILITY
Location: BLDG. 5,REAR
Date of Operation or Occurrence: PRIOR TO 1977
Owner/Operator: OHARE ARFF
Comments/Description: WASTE OIL DISPOSED OF ONTO GROUND

Site Rated by: GREGORY,McLEOD & REIMER

I. RECEPTORS

Rating Factor	Factor Rating (0-3)	Multi-plier	Factor Score	Maximum Possible Score
A. Population within 1,000 feet of site	3	4	12	12
B. Distance to nearest well	1	10	10	30
C. Land use/zoning within 1 mile radius	3	3	9	9
D. Distance to reservation boundry	3	6	18	18
E. Critical environments within 1 mile radius of site	3	10	30	30
F. Water quality of nearest surface water body	1	6	6	18
G. Ground water use of uppermost aquifer	0	9	0	27
H. Population served by surface water supply within 3 miles downstream of site	0	6	0	18
I. Population served by ground-water supply within 3 miles of site	3	6	18	18
Subtotals			103	180

Receptors subscore (100 x factor score subtotal/maximum score subtotal) 57

II. WASTE CHARACTERISTICS

A. Select the factor score based on the estimated quantity, the degree of hazard, and the confidence level of the information.

1. Waste quantity (1=small, 2=medium, 3=large) 1
2. Confidence level (1=confirmed, 2=suspected) 1
3. Hazard rating (1=low, 2=medium, 3=high) 1

Factor Subscore A (from 20 to 100 based on factor score matrix) 30

B. Apply persistence factor
Factor Subscore A x Persistence Factor = Subscore B

30 x 0.80 = 24

C. Apply physical state multiplier
Subscore B x Physical State Multiplier = Waste Characteristics Subscore

24 x 1.00 = 24

III. PATHWAYS

A. If there is evidence of migration of hazardous contaminants, assign maximum factor subscore of 100 points for direct evidence or 80 points for indirect evidence. If direct evidence exists then proceed to C. If no evidence or indirect evidence exists, proceed to B.

Subscore 0

B. Rate the migration potential for 3 potential pathways: surface water migration, flooding, and ground-water migration. Select the highest rating and proceed to C.

Rating Factor	Factor Rating (0-3)	Multi-plier	Factor Score	Maximum Possible Score
1. Surface Water Migration				
Distance to nearest surface water	3	8	24	24
Net precipitation	1	6	6	18
Surface erosion	1	8	8	24
Surface permeability	3	6	18	18
Rainfall intensity	2	8	16	24
Subtotals			72	108
Subscore (100 x factor score subtotal/maximum score subtotal)				67
2. Flooding	0	1	0	3
Subscore (100 x factor score/3)				0
3. Ground-water migration				
Depth to ground water	3	8	24	24
Net precipitation	1	6	6	18
Soil permeability	0	8	0	24
Subsurface flows	0	8	0	24
Direct access to ground water	1	8	8	24
Subtotals			38	114
Subscore (100 x factor score subtotal/maximum score subtotal)				33

C. Highest pathway subscore.

Enter the highest subscore value from A, B-1, B-2 or B-3 above.

Pathways Subscore 67

IV. WASTE MANAGEMENT PRACTICES

A. Average the three subscores for receptors, waste characteristics, and pathways.

Receptors		57	
Waste Characteristics		24	
Pathways		67	
Total	148	divided by 3 =	49 Gross total score

B. Apply factor for waste containment from waste management practices.

Gross total score x waste management practices factor = final score

49 x 1.00 = 49

HAZARD ASSESSMENT RATING METHODOLOGY FORM

Name of Site: LOW LEVEL RADIOACTIVE DISPOSAL SITE
Location: IMMEDIATELY EAST OF SOUTH POL AREA
Date of Operation or Occurrence: PRIOR TO 1970
Owner/Operator: OHARE ARFF
Comments/Description: VACUUM TUBE DISPOSED OF INTO EARTH

Site Rated by: GREGORY, McLEOD & REIMER

I. RECEPTORS

Rating Factor	Factor Rating (0-3)	Multi-plier	Factor Score	Maximum Possible Score
A. Population within 1,000 feet of site	3	4	12	12
B. Distance to nearest well	1	10	10	30
C. Land use/zoning within 1 mile radius	3	3	9	9
D. Distance to reservation boundry	3	6	18	18
E. Critical environments within 1 mile radius of site	3	10	30	30
F. Water quality of nearest surface water body	1	6	6	18
G. Ground water use of uppermost aquifer	0	9	0	27
H. Population served by surface water supply within 3 miles downstream of site	0	6	0	18
I. Population served by ground-water supply within 3 miles of site	3	6	18	18
Subtotals			103	180

Receptors subscore (100 x factor score subtotal/maximum score subtotal) 57

II. WASTE CHARACTERISTICS

A. Select the factor score based on the estimated quantity, the degree of hazard, and the confidence level of the information.

1. Waste quantity (1=small, 2=medium, 3=large) 1
2. Confidence level (1=confirmed, 2=suspected) 1
3. Hazard rating (1=low, 2=medium, 3=high) 1

Factor Subscore A (from 20 to 100 based on factor score matrix) 30

B. Apply persistence factor
Factor Subscore A x Persistence Factor = Subscore B

30 x 1.00 = 30

C. Apply physical state multiplier
Subscore B x Physical State Multiplier = Waste Characteristics Subscore

30 x 0.50 = 15

III. PATHWAYS

A. If there is evidence of migration of hazardous contaminants, assign maximum factor subscore of 100 points for direct evidence or 80 points for indirect evidence. If direct evidence exists then proceed to C. If no evidence or indirect evidence exists, proceed to B.

Subscore 0

B. Rate the migration potential for 3 potential pathways: surface water migration, flooding, and ground-water migration. Select the highest rating and proceed to C.

Rating Factor	Factor Rating (0-3)	Multi-plier	Factor Score	Maximum Possible Score
1. Surface Water Migration				
Distance to nearest surface water	3	8	24	24
Net precipitation	1	6	6	18
Surface erosion	1	8	8	24
Surface permeability	3	6	18	18
Rainfall intensity	2	8	16	24
Subtotals			72	108
Subscore (100 x factor score subtotal/maximum score subtotal)				67
2. Flooding	0	1	0	3
Subscore (100 x factor score/3)				0
3. Ground-water migration				
Depth to ground water	3	8	24	24
Net precipitation	1	6	6	18
Soil permeability	0	8	0	24
Subsurface flows	0	8	0	24
Direct access to ground water	1	8	8	24
Subtotals			38	114
Subscore (100 x factor score subtotal/maximum score subtotal)				33

C. Highest pathway subscore.
Enter the highest subscore value from A, B-1, B-2 or B-3 above.

Pathways Subscore 67

IV. WASTE MANAGEMENT PRACTICES

A. Average the three subscores for receptors, waste characteristics, and pathways.

Receptors		57
Waste Characteristics		15
Pathways		67
Total	139 divided by 3 =	46 Gross total score

B. Apply factor for waste containment from waste management practices.
Gross total score x waste management practices factor = final score

46 x 0.95 = 44

APPENDIX I

REFERENCES

APPENDIX I
REFERENCES

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APPENDIX J
GLOSSARY OF TERMINOLOGY AND ABBREVIATIONS

APPENDIX J

GLOSSARY OF TERMINOLOGY AND ABBREVIATIONS

AF: Air Force

AFFF: Aqueous Film Forming Foam

AFB: Air Force Base

AFCS: Air Force Communications Service

AFESC: Air Force Engineering and Services Center

AFR: Air Force Regulation

AFSC: Air Force Systems Command

Ag: Chemical symbol for silver

AGE: Aerospace Ground Equipment

Al: Chemical symbol for aluminum

ALLUVIUM: Unconsolidated sediments deposited in relatively recent geologic time by the action of water

ARTESIAN: Ground water contained under hydrostatic pressure

AQUICLUDE: Poorly permeable formation that impedes ground-water movement and does not yield water to a well or spring

AQUIFER: A geologic formation, group of formations, or part of a formation that is capable of yielding water to a well or spring

AQUITARD: A soils formation which impedes ground-water flow

ARFF: Air Reserve Force Facility

AVGAS: Aviation Gasoline

Ba: Chemical symbol for barium

Bedrock: Any solid rock exposed at the surface of the earth or overlain by unconsolidated material.

BIOACCUMULATE: Tendency of elements or compounds to accumulate or build up in the tissues of living organisms when they are exposed to these elements in their environments, e.g., heavy metals

CAP: Civilian Air Patrol

Cd: Chemical symbol for cadmium

CE: Civil Engineering

CERCLA: Comprehensive Environmental Response, Compensation and Liability Act

CES: Civil Engineering Squadron

CLOSURE: The completion of a set of rigidly defined functions for a hazardous waste facility no longer in operation

COD: Chemical Oxygen Demand, a measure of the amount of oxygen required to oxidize organic and oxidizable inorganic compounds in water

COE: Corps of Engineers

COMD: Command

CONFINED AQUIFER: An aquifer bounded above and below by impermeable beds or by beds of distinctly lower permeability than that of the aquifer itself

CONTAMINATION: The degradation of natural water quality to the extent that its usefulness is impaired; there is no implication of any specific limits since the degree of permissible contamination depends upon the intended end use or uses of the water

Cr: Chemical symbol for chromium

Cu: Chemical symbol for copper

DET: Detachment

DIP: The angle at which a stratum is inclined from the horizontal

DISPOSAL FACILITY: A facility or part of a facility at which hazardous waste is intentionally placed into or on land or water, and at which waste will remain after closure

DISPOSAL OF HAZARDOUS WASTE: The discharge, deposit, injection, dumping, spilling, or placing of any hazardous waste into or on land or water so that such waste or any constituent thereof may enter the environment or be emitted into the air or discharged into any waters, including ground water

DOD: Department of Defense

DOWNGRADIENT: In the direction of decreasing hydraulic static head; the direction in which ground water flows

DPDO: Defense Property Disposal Office, previously included Redistribution and Marketing (R&M) and Salvage.

DUMP: An uncovered land disposal site where solid and/or liquid wastes are deposited with little or no regard for pollution control or aesthetics; dumps are susceptible to open burning and are exposed to the elements, disease vectors and scavengers

EOD: Explosive Ordnance Disposal

EFFLUENT: A liquid waste discharge from a manufacturing or treatment process, in its natural state, or partially or completely treated, that discharges into the environment

EP: Extraction Procedure, the EPA's standard laboratory procedure for leachate generation

EPA: U.S. Environmental Protection Agency

EROSION: The wearing away of land surface by wind or water

FAA: Federal Aviation Administration

FACILITY: Any land and appurtenances used for the treatment, storage and/or disposal of hazardous wastes

Fe: Chemical symbol for iron

FLOOD PLAIN: The lowland and relatively flat areas adjoining inland and coastal areas of the mainland and off-shore islands, including, at a minimum, areas subject to a one percent or greater chance of flooding in any given year

FLOW PATH: The direction or movement of ground water and any contaminants that may be contained therein, as governed principally by the hydraulic gradient

GC/MS: Gas chromatograph/mass spectrophotometer, a laboratory procedure for identifying unknown compounds

GROUND WATER: Water beneath the land surface that is under atmospheric or artesian pressure

GROUND WATER RESERVOIR: The earth materials and the intervening open spaces that contain ground water

HALF-LIFE: The time required for half the atoms present in radioactive substance to decay

HARDFILL: Disposal sites receiving construction debris, wood, miscellaneous spoil material

HARM: Hazard Assessment Rating Methodology

HAZARDOUS WASTE: A solid waste, or combination of solid wastes, which because of its quantity, concentration, or physical, chemical or infectious characteristics may cause or significantly contribute to an increase in mortality or an increase in serious, irreversible, or incapacitating reversible illness; or

pose a substantial present or potential hazard to human health or the environment when improperly treated, stored, transported, or disposed of, or otherwise managed (RCRA)

HAZARDOUS WASTE GENERATION: The act or process of producing a hazardous waste

HEAVY METALS: Metallic elements, including the transition series, which include many elements required for plant and animal nutrition in trace concentrations but which become toxic at higher concentrations

Hg: Chemical symbol for mercury

HQ: Headquarters

HWMF: Hazardous Waste Management Facility

INCOMPATIBLE WASTE: A waste unsuitable for commingling with another waste or material because the commingling might result in generation of extreme heat or pressure, explosion or violent reaction, fire, formation of substances which are shock sensitive, friction sensitive, or otherwise have the potential for reacting violently, formation of toxic dusts, mists, fumes, and gases, volatilization of ignitable or toxic chemicals due to heat generation in such a manner that the likelihood of contamination of ground water or escape of the substance into the environment is increased, any other reaction which might result in not meeting the air, human health, and environmental standard

INFILTRATION: The gradual passing of liquid through matter.

IRP: Installation Restoration Program

JP-4: Jet Fuel

LEACHATE: A solution resulting from the separation or dissolving of soluble or particulate constituents from solid waste or other man-placed medium by percolation of water

LEACHING: The process by which soluble materials in the soil, such as nutrients, pesticide chemicals or contaminants, are washed into a lower layer of soil or are dissolved and carried away by water

LINER: A continuous layer of natural or man-made materials beneath or on the sides of a surface impoundment, landfill, or landfill cell which restricts the downward or lateral escape of hazardous waste, hazardous waste constituents or leachate

LOESS: A sediment composed dominantly of silt-size particles that has been deposited primarily by the wind

LOX: Liquid Oxygen

LYSIMETERS: A vacuum operated sampling device used for extracting pore water samples at various depths within the unsaturated zone

MEK: Methyl Ethyl Ketone

MGD: million gallons per day

MOA: Military Operating Area

MOGAS: Motor gasoline

Mn: Chemical symbol for manganese

MONITORING WELL: A well used to measure ground-water levels and to obtain samples

MSL: Mean Sea Level

MUNITION ITEMS: Munitions or portions of munitions having an explosive potential

MUNITIONS RESIDUE: Non-explosive segments of waste munitions (i.e., bomb casings)

NCO: Non-commissioned Officer

NCOIC: Non-commissioned Officer In-Charge

NDI: Non-destructive Inspection

NET PRECIPITATION: The amount of annual precipitation minus annual evaporation

NGVD: National Geodetic Vertical Datum

Ni: Chemical symbol for nickel

NPDES: National Pollutant Discharge Elimination System

OEHL: Occupational and Environmental Health Laboratory

ORGANIC: Being, containing or relating to carbon compounds, especially in which hydrogen is attached to carbon

O&G: Symbols for oil and grease

OSI: Office of Special Investigations

OVA: Organic Vapor Analyzer

Pb: Chemical symbol for lead

PCB: Polychlorinated Biphenyls; highly toxic to aquatic life; they persist in the environment for long period and are biologically accumulative

PERCOLATION: Movement of moisture by gravity or hydrostatic pressure through interstices of unsaturated rock or soil

PERMEABILITY: The rate at which fluids may move through a solid, porous medium

PD-680: Cleaning solvent, safety solvent, Stoddard solvent, petroleum distillate

pH: Negative logarithm of hydrogen ion concentration; measurement of acids and bases

PL: Public Law

POL: Petroleum, Oils and Lubricants

POLLUTANT: Any introduced gas, liquid or solid that makes a resource unfit for a specific purpose

POTENTIALLY ACTIVE FAULT: A fault along which movement has occurred within the last 25-million years

PPM: Parts per million by weight

PRECIPITATION: Rainfall

RCRA: Resource Conservation and Recovery Act

RECHARGE AREA: An area in which water is absorbed that eventually reaches the zone of saturation in one or more aquifers

RECHARGE: The addition of water to the ground-water system by natural or artificial processes

RECON: Reconnaissance

SANITARY LANDFILL: A land disposal site using an engineered method of disposing solid wastes on land in a way that minimizes environmental hazards

SATURATED ZONE: That part of the earth's crust in which all voids are filled with water

SEISMICITY: Pertaining to earthquakes or earth vibrations

SLUDGE: The solid residue resulting from a manufacturing or wastewater treatment process which also produces a liquid stream

SOLID WASTE: Any garbage, refuse, or sludge from a waste treatment plant, water supply treatment, or air pollution control facility and other discarded material, including solid, liquid, semi-solid, or contained gaseous material resulting from industrial, commercial, mining, or agricultural operations and from community activities, but does not include solid or dissolved materials in domestic sewage; solid or dissolved materials in irrigation return flows; industrial discharges which are point source subject to permits under Section 402 of the Federal Water Pollution Control Act, as amended (86 USC 880); or source, special nuclear, or by-product material as defined by the Atomic Energy Act of 1954 (68 USC 923)

SPILL: Any unplanned release or discharge of a hazardous waste onto or into the air, land, or water

STORAGE OF HAZARDOUS WASTE: Containment, either on a temporary basis or for a longer period, in such a manner as not to constitute disposal of such hazardous waste

TAC: Tactical Air Command

TAG: Tactical Airlift Group

TCE: Tetrachloroethylene

TCA: 1,1,1-Tetrachloroethane

TOC: Total Organic Carbon

TOXICITY: The ability of a material to produce injury or disease upon exposure, ingestion, inhalation, or assimilation by a living organism

TRANSMISSIVITY: The rate at which water is transmitted through a unit width under a unit hydraulic gradient

TREATMENT OF HAZARDOUS WASTE: Any method, technique, or process including neutralization designed to change the physical, chemical, or biological character or composition of any hazardous waste so as to neutralize the waste or so as to render the waste nonhazardous

UPGRADIENT: In the direction of increasing hydraulic static head; the direction opposite to the prevailing flow of ground-water

USAF: United States Air Force

USGS: United States Geological Survey

WATER TABLE: Surface of a body of unconfined ground water at which the pressure is equal to that of the atmosphere

Zn: Chemical symbol for zinc

APPENDIX K

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